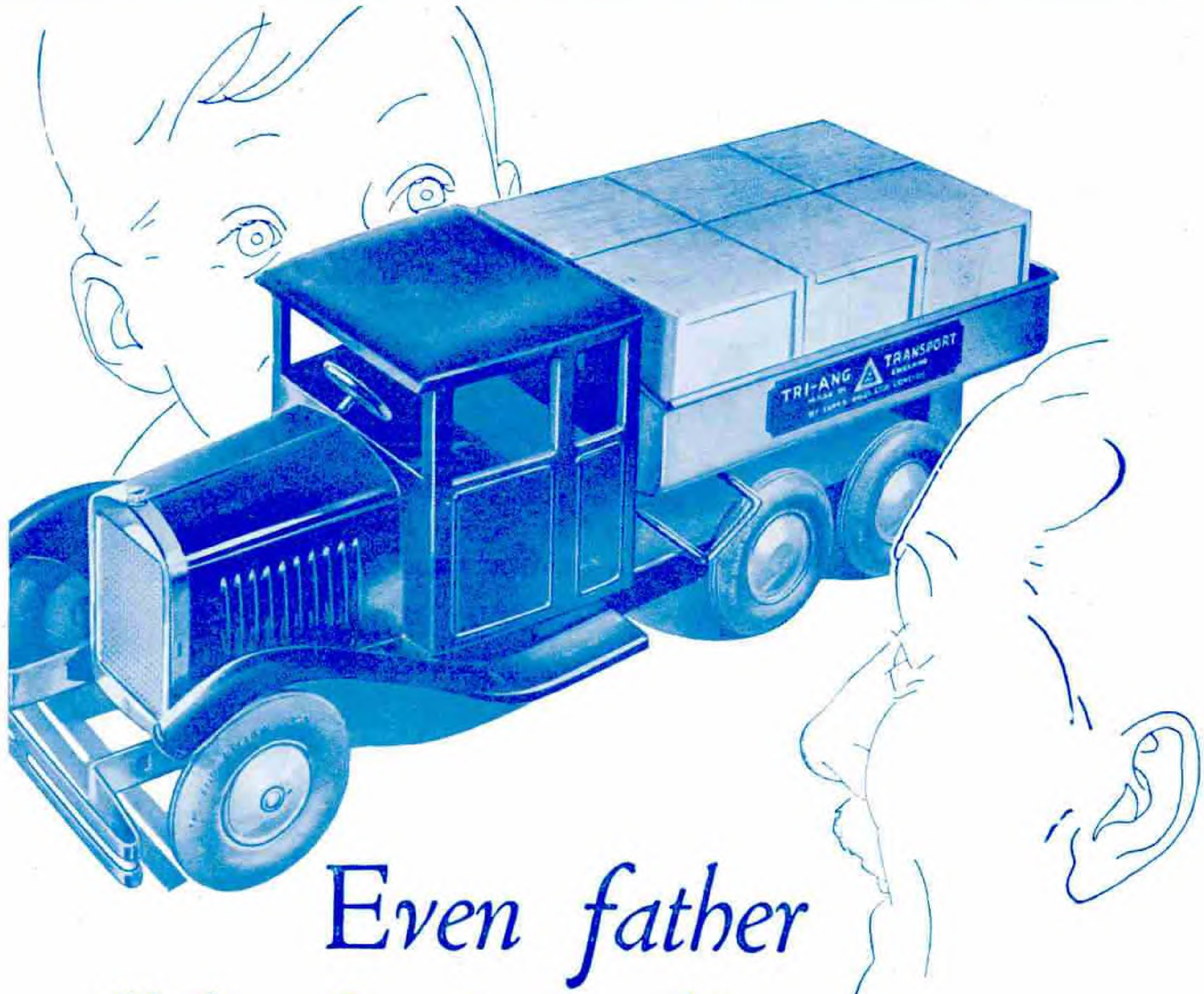
VOL. XVII. No. 6 JUNE 1932

MECCANO MAGAZINE



A TIGHT CORNER IN THE HIMALAYAS
(see page 410)

6D.



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1. All parts built to scale, of heavy gauge steel.
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With the Editor

Dangers of "Safety First"

During recent years the slogan "Safety First" has come into prominence in a remarkable manner It was introduced with the object of bringing about a decrease in the enormous number of accidents occurring every year on the road and in factories and workshops; and for this purpose "Safety First" as a rule for daily use is ideal. As a rule of life, however, the slogan is not so good. If "Safety First" principles had governed human actions throughout the centuries, America would never have been discovered, the Arctic and Antarctic regions would for ever have been unknown and shrouded in mystery, and the British Empire would never have been founded.

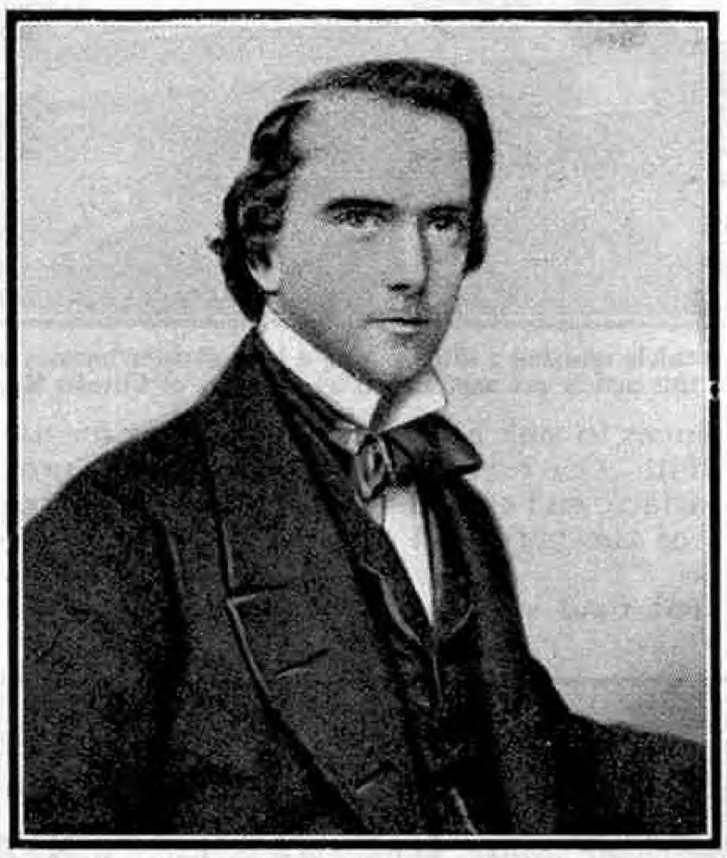
A few days ago I was talking to a boy who is shortly due to leave school, and I asked him what career he proposed to follow. "I don't know," he replied in a casual manner; "I suppose I shall go into an office of some kind." That boy probably will do as he said, and will drive through life in a humdrum fashion. His job will be safe, comfortable, and not too strenuous, and he will be satisfied to draw his comparatively small salary week by week, with an increase from time to time as somebody above him leaves the office or dies. I hope that the majority of my readers are not like this boy.

When the end of his schooldays is approaching, a boy of normal health and ability should begin to think seriously about his career. I know quite well that some boys, because of unusual home responsibilities, must necessarily take a "safe" job bringing in a regular salary without risk; while to other boys there inevitably falls the task of carrying on some work begun by their fathers. The majority of boys have no such restrictions, however, and are free to choose their own careers; and I strongly urge every one of them not to allow his decision to be influenced by "Safety First" principles. Every normal boy has an ambition of some kind. Sometimes this ambition may be an obviously impossible one, but in most cases it can be achieved if the boy has sufficient grit, is prepared to throw his whole heart and soul into whatever work may be necessary to reach the desired end, and to face unflinchingly the risks that may be involved.

A Pioneer of Ocean Telegraphs

This month occurs the centenary of the birth of Sir Charles Tilston Bright, the engineer who achieved fame at the age of 26 by laying the first electric telegraph cable across the Atlantic Ocean. Bright was born on 8th June 1832, and when he undertook the responsible post of engineer to the company formed to lay the first Atlantic cable he had already achieved a considerable reputation as the result of his success in connecting England and Ireland by cable. Three previous efforts to do this had failed, and it was left to this 21-year-old engineer to carry out the task of laying the first cable to be taken across a deep sea.

The laying of the Atlantic cable was the most brilliant achievement of Bright's career. Many engineers believed that the scheme was impossible, and Professor Airy, then Astronomer Royal, stated definitely that a cable could not be submerged to the depth of the bed of the Atlantic, and that even if this could be done, messages could not be transmitted over so great a distance. The first efforts seemed to suggest that the critics of the scheme were right, for the cable broke after only 380 miles of it had been laid. A second effort was little more successful, but Bright and his immediate associates doggedly set out for a third time on what was regarded as "a mad freak of stubborn ignorance," and, to the amazement of the public, the Old World and the New were brought into communication with one another by telegraph. This success came in 1858, and we may imagine the bitter disappointment of the young engineer when the cable failed after only 732 messages had been transmitted. It was soon proved, however, that this breakdown was not due to any defect in the cable, but to the use of electric power greater than it could stand. Seven years later a new cable was laid with comparatively little trouble in 14 days. All the important seas of the world are now crossed by cables, which play an enormous part in the transmission of news and in the carrying on of trade and commerce.



Sir Charles T. Bright, 1832-1888.

It is interesting to compare the state of affairs existing when Bright laid the first Atlantic cable with the conditions of to-day. Bright had to devise his own methods of making the cable and of stowing it in the comparatively slow and clumsy vessels then available; and in addition had to design the machinery required to carry out the delicate task of paying out the cable as the vessel proceeded. Cable laying in those days was not only difficult, but often dangerous. On one occasion Bright and his men suffered so severely from fever while laying cables that on four successive days the engineer recorded in his diary the death of one man and the funeral of one who had died on the previous day. In other parts of the world Bright was in danger of attack by pirates, or of drowning in storms that threatened to overwhelm the heavily laden cable ships; while on one occasion the shore end of a cable had to be landed by men wading in slush and mud 4 ft. in depth for a distance of more than four miles in a terrific tropical thunderstorm.

The early cables suffered severely from the attacks of many sea creatures. The most persistent of these animals were the teredos, little marine worms that bore their way through wood and similar materials, and appeared to have a special liking for submerged cables in tropical seas. Bright mixed calcined flint with the covering compound of his cables, and later reported with glee that this gritty material had effectively broken the teredos' teeth! A remarkable occurrence was the cause of a break in a cable laid in the Indian Ocean. The broken end was fished for and found with a grapnel, and when hauling-in operations commenced it was noticed that the cable seemed unusually heavy. When it finally reached the surface the men were amazed to find that they had pulled up with it the decomposed body of a large whale. It is believed that the creature had rubbed its tail along the cable in order to get rid of barnacles, and had become entangled in it. Its subsequent struggles caused the cable to part, and ensured its own doom by completely entangling it in the coils.

To-day cable laying is carried out by ships specially designed and built for the work, and fitted with wonderfully perfect machinery and instruments for paying out or picking up the cable, and for carrying out the necessary tests. In addition their crews do not suffer the hardships and discomforts of the pioneers.

Transport in Roadless Countries

Crossing Deserts and Mountain Ranges

THE invention of the wheel, one of man's greatest triumphs, came about in prehistoric times, and probably was suggested by the use of tree trunks as rollers for moving heavy objects. Later, holes were bored through the centres of logs in order to enable wooden axles to be fitted, and thus the true wheel came into existence. As the use of iron spread, the wheel was made stronger by fitting round it tyres made of this metal, and other improvements then slowly led to the various forms of wheel employed to-day. Wheeled vehicles have now practically displaced the pack animal and the porter, these forms of transport being employed only in very rough conditions, or in primitive countries.

The use of wheels made it necessary to construct roads, for they concentrate the weight of their load on a very small area, and thus sink into soft ground, forming ruts and destroying the surface. It is not generally realised that sinking of this kind greatly increases the effort that is required to move a wheel. In reality, a wheel that travels in a depression has to be hauled up an incline with a severe gradient, and as it continues to sink as it rolls along, there is always a steep slope in front of it. One remedy is to provide a solid road bed with a very hard surface, and efforts in this direction have led to the development of the hard and durable road surfaces of to-day.

The cost of producing and maintaining efficient road surfaces is very high, however, and it is only among highly developed and flourishing communities that we find a network of roads sufficiently good to make wheeled transport efficient. In Great Britain and other civilised countries there are many good roads and excellent transport organisations, but in other parts of the world there are large areas where good roads are rare, although their development depends upon adequate transport. For instance, most of the roads in the Gold Coast, Uganda and other African countries are practically without foundations, and are provided with very light metalling to form the surface. Such roads are suitable for light-wheeled traffic in dry weather, but are impracticable to all forms of transport during the rainy season.

There are also large tracts of rich territory as yet untouched by roads or railways, and unexploited because of the difficulties of transport. Both roads and railways are too costly to be used in the preliminary work of opening up new lands, and penetration by means of wagons drawn by horses or oxen is tedious and slow. The only alternative is the employment of mechanical transport designed and built specially for the conquest of primitive conditions, and to-day the development of virgin country depends to a very large extent on the available resources of motor transport. The ordinary four-wheeled motor vehicle is not suitable for transport service over stony and mountainous roads, nor for cross-country work over desert or other difficult ground. The problem of penetrating into rough country has been solved by substituting specially designed creeper track mechanism for the rear wheels, however, and cars equipped in this manner readily travel across marshes, or rock-strewn and sandy ground; and are not held up by deep snow, even on severe mountain gradients.



A Citroën Kegresse vehicle crossing a ditch during a long pioneer journey across Africa. The illustrations to this article are reproduced by courtesy of Citroën Kegresse Limited.

The value of creeper track as a means of traversing ground impassable or difficult to ordinary wheeled vehicles was demonstrated clearly by the successful manœuvres of the "tanks" used during the War. Artillery tractors fitted with creeper track are used regularly by military authorities, and armoured cars, ambulance cars and infantry supply column lorries are other types of military vehicles now equipped with this mechanism for use in mountainous regions. In civilian transport work vehicles provided with creeper track have proved invaluable to mountaineering and other expeditions, and our cover this month shows one of the heavily laden cars of a German mountain-climbing expedition in the Himalayas negotiating a particularly difficult corner in the rugged country through which the approach was made to the peaks to be surmounted.



An armoured car equipped with creeper track fording a stream during military operations.

Some remarkable transport feats over difficult and roadless country have been accomplished by Citroën Kegresse vehicles. These are Citroën cars equipped with a patent creeper track. The track mechanism at each side of the vehicle consists of an endless belt that passes over a series of driving pulleys and weight-carrying rollers, lugs on the rims of the pulleys engaging with driving teeth placed along the inner surface of the belt. The weight-carrying rollers run along the path formed by the inner surface of the belt and are mounted in such a manner that they conform with any irregularities of the ground traversed by the vehicle.

In 1922 Citroën Kegresse vehicles were tested successfully in the snow on the Alps and Pyrenees, and in 1922-3 the first crossing of the Sahara desert by motor was accomplished in vehicles of this type. This expedition consisted of five cars and was in charge of Mr. Haardt, general manager of the Citroën works, assisted by M. Audouin-Dubreuil. It left Tugurt at dawn on 17th December, 1922, to attempt for the first time the opening up of direct motor communication between North Africa and the Niger

Valley. The expedition followed the caravan route and forged ahead steadily, the creeper tracks of the vehicles negotiating the sandy plain without difficulty. The Fort of Hassi Inifel was reached on the 19th December, and after leaving there the expedition traversed a desolate upland covered with stones and cut with deep crevices, and descended through sinister gorges toward the plains of Tidikelt.

At In-Salah, an oasis in the desert, the pioneers were met by the entire population carrying palm branches, and Arab horsemen greeted them by firing a salute. After a couple of days' well-earned rest the expedition moved on again at dawn on Christmas Eve, and crossed the vast wind-swept plains of Tidikelt, finding the route plainly marked by a gruesome trail of skeletons of camels. The sandy wilderness eventually gave way to rock-strewn stony desert, but in spite of these new conditions the cars continued without any slackening of speed. Although matters were rendered more difficult by the absence of tracks, the expedition's excellent progress was maintained, and more than 124 miles per day were covered. During Christmas night, camp was pitched on the borders of the dreaded Hoggar Range, the veritable centre of the Sahara.

After safely negotiating the rocky fastnesses of the Hoggar Range, the expedition came to the almost unknown Tanezrouft, or "Great Desert of Thirst." This is a region of sandhills and plains with frequent rugged outcroppings of rock, and has been called the "country of mysterious disappearances" because of the many travellers who have perished in its terrible sandstorms, leaving no traces behind them. While the party was crossing this desert, a great sandstorm appeared upon the horizon and swept down upon them with terrific force. It was almost impossible to see what lay ahead, for the air was full of gritty particles of sand, and the members of the expedition had great difficulty in breathing and in keeping in touch with each other. The Great Tanezrouft, until then inviolate to motor cars, seemed to be trying to avenge itself upon the little Citroëns, but eventually the storm passed and the journey was resumed.

Beyond the desert the cars threaded their way through the grassy steppes of the Niger country to Burem, a fort on a hillock overlooking the river. The final stage, from Burem to Timbuctoo, was over ground thickly covered with brushwood, but this did not in any way hinder the creeper track vehicles, and the distance was covered non-stop in 27 hours. Timbuctoo was reached on 7th January, 1923, exactly three weeks after leaving Tugurt. There the expedition was met by the Commander of the district, who was accompanied by officers and civil authorities, and was escorted by natives on horseback; and he congratulated the members of the expedition on the success of their efforts. During this pioneer journey the cars behaved admirably and in spite of the adverse ground conditions encountered, they attained at times a speed of 30 m.p.h.

In 1924 a more extensive journey across Africa was carried out by M. Haardt and M. Audouin-Dubreuil. The chief purpose of this expedition was to demonstrate the feasibility of motor transport across Central Africa, and to trace a route for the railway that eventually may be built across the desert. Eight 10 h.p. Citroën Kegresse vehicles were employed, and on account of the great quantity of equipment that had to be carried it was necessary to provide each car with a trailer, and both cars and trailers were fitted with extra water, gas and oil tanks.

The expedition set out from the railhead at Colomb Bechar, in Algeria, on 28th October, 1924, to cross desert and jungle, some of which had never before been traversed by mechanical means. As the creeper track vehicles spread through the miniature ravines and over the hillocks of the South Algerian Plain they looked for all the world like the vessels of a flotilla performing manœuvres on a rough sea. The first stage of the long journey was across the French Sahara, which had been crossed by the previous expedition, and on 10th November, the expedition entered the Tanezrouft, where a stretch of more than 330 miles was covered without finding a drop of water. The dried skeletons of travellers who had died of thirst, were found, the bleaching bones being all that remained of a caravan from the Soudan that had miscalculated its water supply.

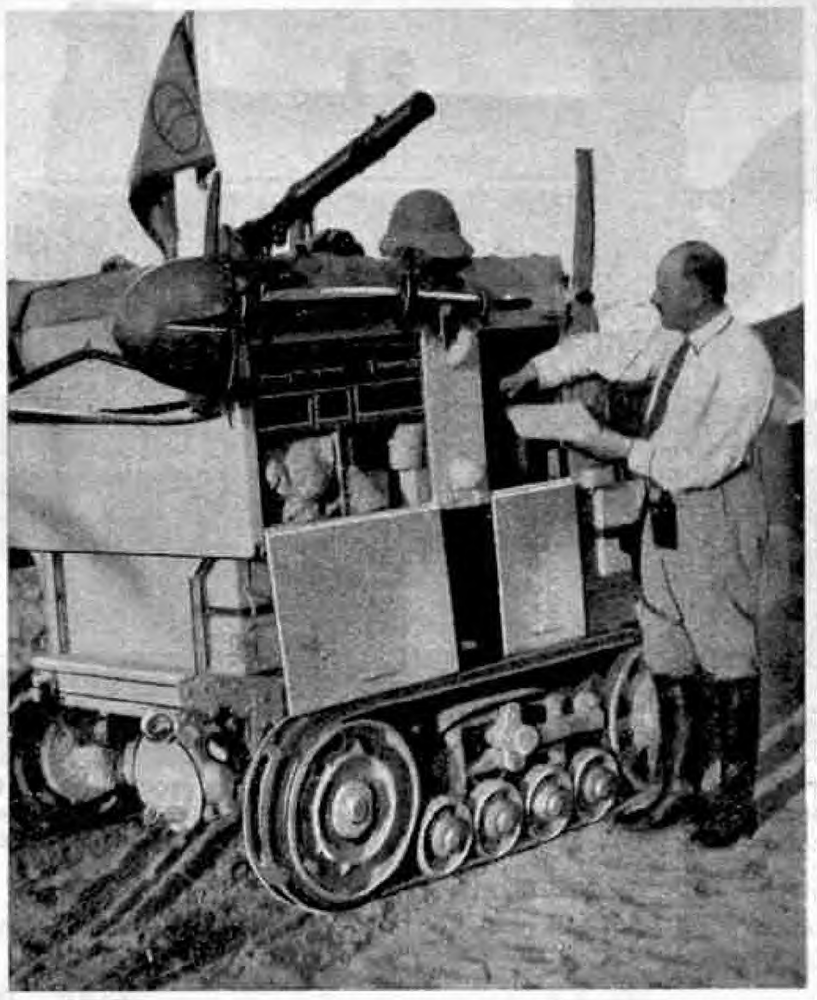
In a personal account of this expedition M. Haardt relates that "after driving for five days in the Tanezrouft our nerves began to feel the effects of its monotony and the vastness of its solitude. Coincidentally we experienced all sorts of difficulties. The cars seemed to sink deeper and deeper into the sandy ground and consumed great quantities of petrol, due to the necessity of an almost constant use of second gear. The blinding brilliance of the sun, the intense heat, and the foul smell of petrol, caused by an everlasting rear wind, all had a disturbing effect and contributed towards the development among us of a very real anxiety lest our gas or water fail before we reached the oasis at Tessalit. Our fears proved groundless however, for we sighted waving palms before our supply of either was near exhaustion."

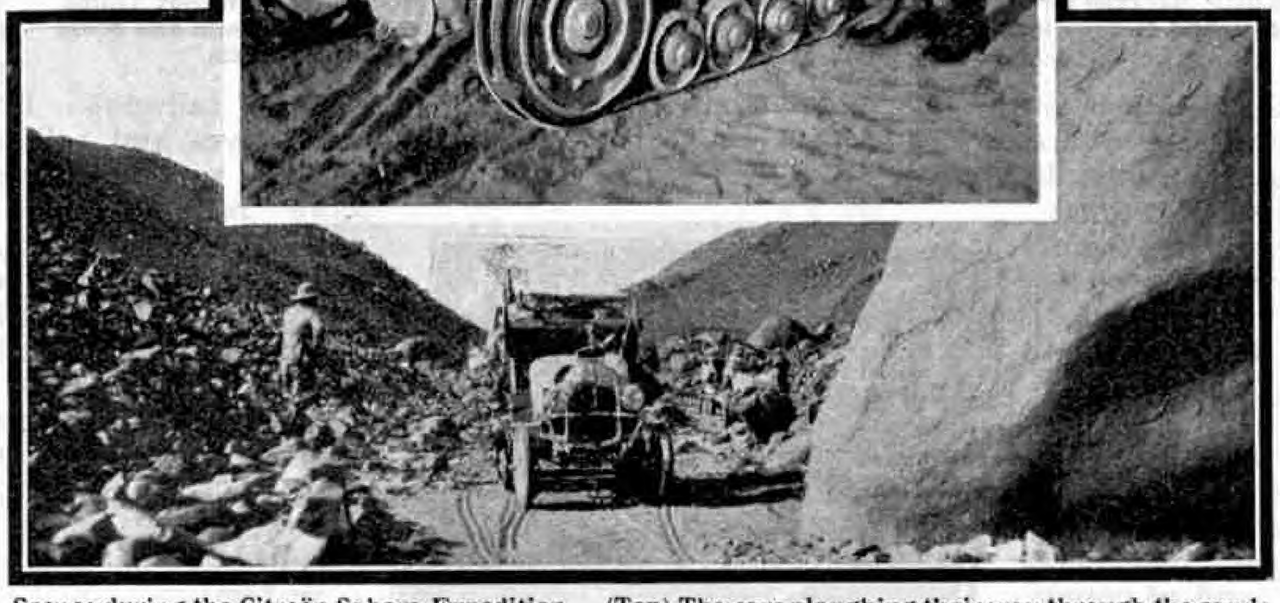
Burem was reached in three weeks and the River Niger followed as far as Niamey, where the expedition turned away and skirted the border of British Nigeria. Eventually it entered the Belgian Congo and was soon in the midst of the Equatorial Forest. The Belgian Administrator of the Colony had employed 40,000 natives to cut a trail 375 miles in length through the forest, and the task had been accomplished in less than a month. In spite of these facilities the journey was a formidable one, but the creeper track cars proved equal to the occasion. After passing through the forest the expedition pushed on to British East Africa.

"Some of the many thrills we experienced came when we took our cars across precarious wooden bridges," says M. Haardt. "They were made of comparatively slender branches tied together with lianas and reclining on light buttresses. They were usually from 80 ft. to 130 ft. long and often from 15 ft. to 35 ft. above the river or ravine. It was always with fear and trepidation that we drove our first car out on these bridges, which creaked and swayed in a most alarming manner, but fortunately most of the vibrations were lateral ones and we suffered no mishaps."

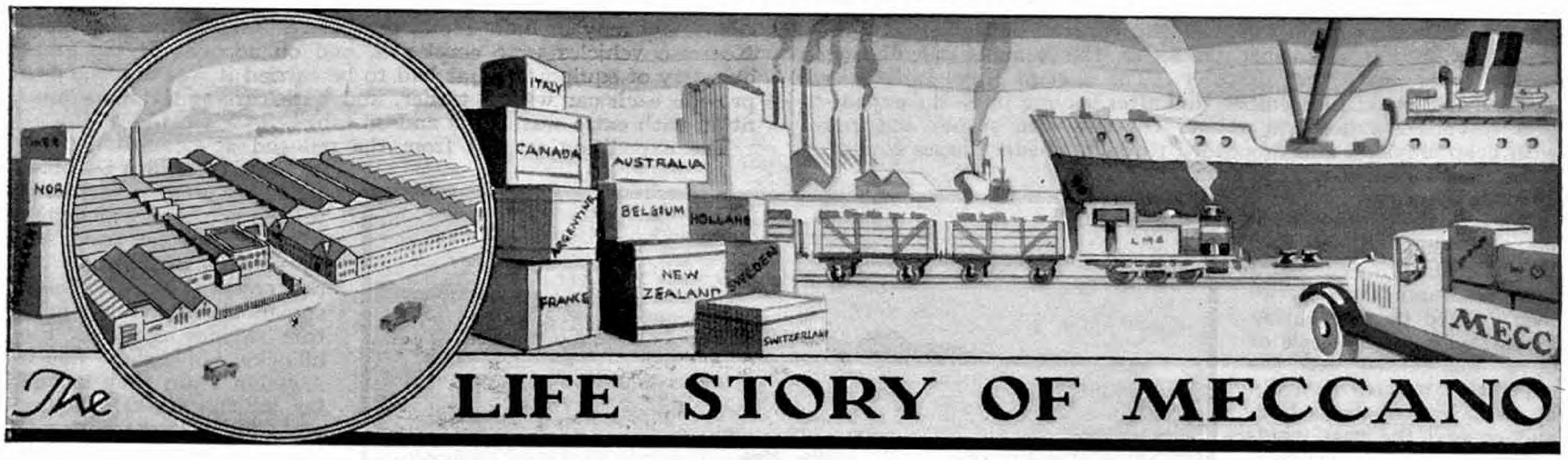
On reaching Lake Victoria, the (*Continued on page 441*)







Scenes during the Citroën Sahara Expedition. (Top) The cars ploughing their way through the sands of the Tanezrouft or "Thirsty Desert." (Centre) A close-up view of one of the cars, showing the patent creeper track. (Bottom) Traversing rocky country in the Sahara.

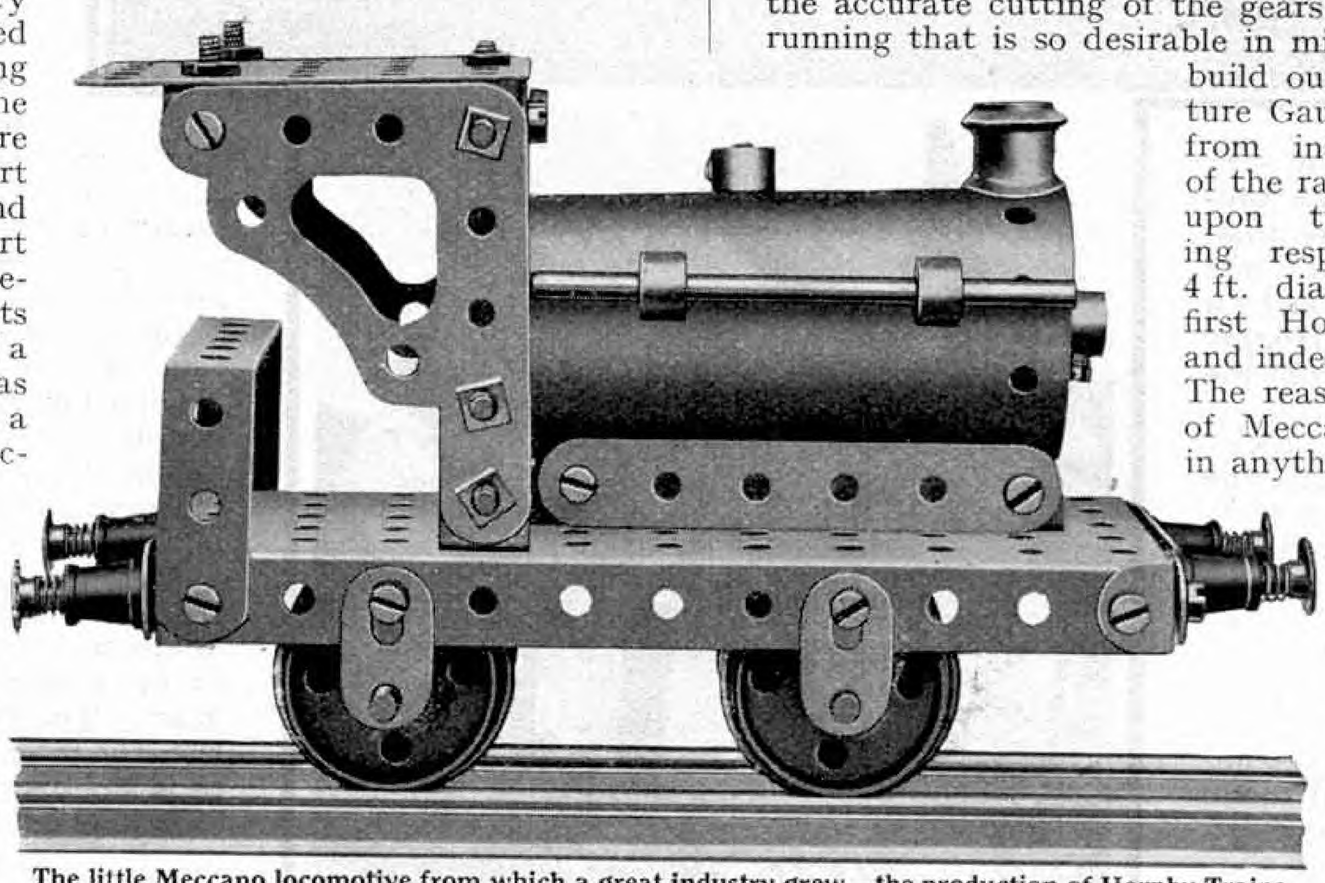


The LIFE STORY OF MECCANO

VI.—By Frank Hornby

THE early history of Hornby Trains is as fascinating as that of Meccano. To begin at the beginning I must take you back to the time of the Great War, a bygone age to most of you but a vivid memory to those of us who survived that stormy period. Among the new parts added to the Meccano System somewhere about this time was Part No. 108, Architrave, and when samples of this part were being examined someone drew attention to its resemblance to the side of a locomotive cab. It was evident that it would be a useful part in the construction of Meccano locomotives, as we had not previously been able to satisfactorily model an engine-cab.

To see exactly how the part would build up we had a model constructed, using another special part for the boiler. The model looked very realistic and, as someone pointed out, its only drawback was the fact that it would not run under its own power. From the construction of this little model was but a step to the idea of marketing a constructional locomotive having a specially-designed clockwork motor, but the idea had to be shelved until such time as our machines were released from the War work on which they were engaged.



The little Meccano locomotive from which a great industry grew—the production of Hornby Trains. The earliest Hornby locomotives, tenders and trucks were built up from standard units and could be taken to pieces and re-built in a similar manner to Meccano models.

The idea, as originated in this little Meccano locomotive, which is illustrated on this page, was one that was to bear abundant fruit in the later years. More particularly so because during the later years of the War there was a scarcity of mechanical toys of all kinds. Prior to 1914 most toys of this nature had been imported from the Continent, and of course when hostilities commenced this source of supply had come to an end. The greatest grievance of the youngsters of that period was the impossibility of obtaining toy trains.

For some time after the Armistice we were fully occupied in making up for lost time in the production of Meccano. We did not lose sight of the possibility of clockwork trains, however, and carried out numerous experiments to develop the earlier ideas on sound practical lines. In 1920 we decided to commence the manufacture of clockwork trains, and in that year the first "Hornby Train" was placed on the market.

These trains were unique in that they applied the Meccano constructional idea. Engines, tenders and trucks were built up from standard units, and could be taken to pieces and rebuilt in a similar manner to Meccano models. In addition, new parts could be purchased at any time to replace any that might be damaged or lost. The clockwork mechanism was of first-class quality, and we paid particular attention to the accurate cutting of the gears in order to ensure the smooth running that is so desirable in miniature trains. We decided to build our trains to the standard miniature Gauge "0," in which the distance from inside to inside of the heads of the rails is $1\frac{1}{4}$ in. We also decided upon two standard curves, forming respectively circles of 2 ft. and 4 ft. diameter. The success of these first Hornby Trains was immediate, and indeed it surpassed all expectations. The reason for this was that the army of Meccano boys had complete faith in anything turned out by the Meccano factory, and consequently Hornby Trains were purchased without hesitation.

From the outset we determined that the Hornby miniature railway system should be just as perfect in its way as Meccano, and the ideal that we kept in mind was that of a gradually growing and developing system that ultimately would be capable of reproducing in miniature practically all the everyday operations of actual railways. Before long we found that the building of locomotives and rolling stock on the Meccano constructional plan was proving a handicap to the development of more realistic and true-to-type models. After careful consideration, therefore, we decided to abandon the constructional plan, and since 1925 all Hornby locomotives and rolling stock have been built from specially-made components, assembled into a complete unit.



The first Hornby Train Set. The engine, tender and truck were built up from standard parts.

In order to provide as great a variety as possible the first Hornby Trains were made available in five colours to represent the London and North Western, Midland, Great Northern, Caledonian, and London, Brighton and South Coast railway systems.

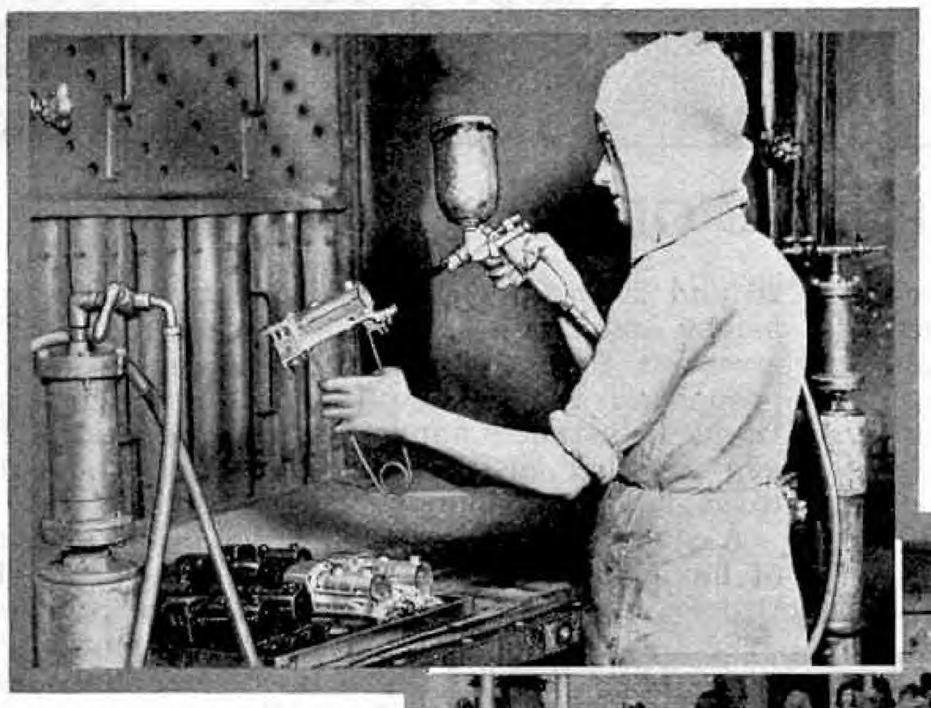
Our first locomotives were well designed and constructed, and we received an astonishing number of letters expressing the keenest enthusiasm in regard to their smooth running and excellent hauling powers. We were not satisfied, however, and a section of our technical staff was set to work to study further the problems involved in the construction of clockwork engines, and to introduce every possible improvement that would make for greater efficiency. This development work has gone on ever since, and as a result Hornby locomotives have been improved steadily year by year until we can fairly claim that they are superior to all rivals.

Along with the development of

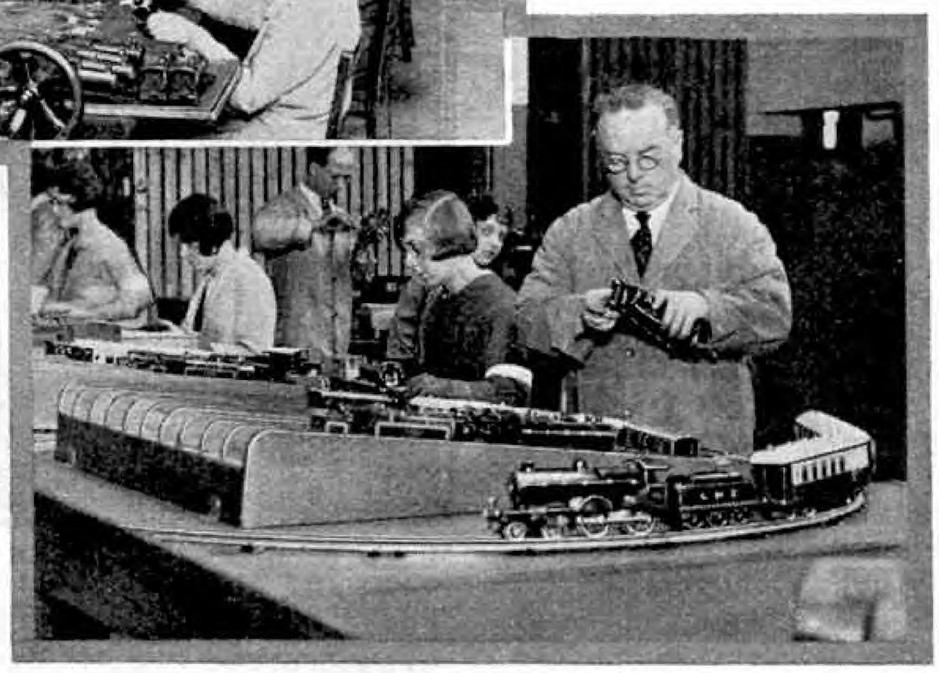
locomotives there has proceeded a steady increase in the number of types of rolling stock and of accessories of all kinds. Many of these items were introduced as the direct result of requests from boys. The suggestions put forward in the letters arriving day by day in large numbers from all parts of the world are carefully tabulated, and when it is seen that there is a widespread demand for a particular item, the production of this is carefully considered. If the idea proves practicable, designs are got out, and before long the new accessory or piece of rolling stock is being turned out by the thousand, to the great joy of the boys who suggested it.

Soon after the introduction of the Hornby System we began to receive requests for electrically-propelled locomotives. We postponed development in this direction until our clockwork trains were thoroughly established, and then in 1925 introduced an electric train set modelled on the lines of the trains of the London Metropolitan Railway. The locomotives of these first Metropolitan sets were operated by high-voltage motors, but before long we abandoned these motors in favour of low-voltage motors, first of four volts and afterwards of six volts. These motors had the great advantage that they could be used either with an alternating current mains supply through a transformer, or from an accumulator. They were thus available for every boy, whether his home had electric light installed or not.

The starting and stopping of these locomotives, and their running speed, are controlled by a special resistance controller situated outside the track, but reversing has to be done by the movement of a lever in the locomotive cab. In response to many requests we introduced some time ago a tank locomotive to be run from a six-volt accumulator, not from the mains, which can be reversed as well as started, stopped and controlled for speed from a controller outside the track. This fast and powerful little locomotive can thus be made to do anything without the necessity of touching it, and it has become a great favourite with Hornby railway enthusiasts.







Hornby Trains in the making. (Top) Enamelling a locomotive by means of a compressed air spray. (Centre) Hand finishing locomotives. (Right) Testing locomotives for hauling power and length of run.

Electric locomotives have the advantage that they do not require to be wound up. They keep on running as long as the current remains switched on, and the un-railway-like spectacle of a train stopping half-way between stations, owing to the clockwork having run down, is avoided. Long continuous runs are possible—one Hornby Train ran continuously for over 800 miles—and at the same time stops may be made as required. In addition there is sufficient power available to enable gradients to be incorporated in a layout, so that an actual descent to and ascent from an underground section of line is possible.

In 1926 the Hornby Control System was introduced, and this has enabled miniature railways to be operated on lines closely following actual practice. By means of a special lever frame and connecting wires, the points and signals of a layout can be controlled from a signal cabin just as is done on a real railway. The application of the Control System to a model railway thus increases its realism and interest to an enormous extent. Another introduction that has tended towards greater realism, especially in shunting operations, is that of automatic couplings. These are now fitted to all Hornby locomotives and rolling stock. They couple on impact, so that an engine may be backed on to its train in the correct manner—a piece of model railway working that is always interesting to watch—and the couplings will engage of their own accord. All that then remains to be done is to reverse the engine, and the train is ready to depart. The speed of operations, particularly in a busy terminal station, is thus considerably increased as compared with the ordinary method of coupling.

The latest additions to the Hornby Railway System have been introduced for the special purpose of giving "life" to a model railway, and providing it with suitable surroundings. The bare and desolate appearance that characterises the station platforms of so many model railways has always seemed to us to be a serious defect, and we determined to do what we could to improve matters in this respect. We therefore introduced first of all a series of miniature platform accessories, including luggage and a porter's barrow, milk cans with a suitable truck, and such items as seats, a letter-box, and automatic machines. To these accessories we have recently added a series of miniature figures—stationmaster, guard, porters, ticket collector, engine driver, hotel porters, etc.—and a station platform provided with a selection of these miniatures immediately takes on an appearance of life and realism that is quite remarkable. The trains must have a reason for running, and a series of miniature passengers is to be added to the existing operating staff. To increase still more the lifelike appearance of the station, miniature posters are available. These are small-scale reproductions in the original colours of the most famous posters that cover the hoardings of our towns and cities. They are gummed on the back, so that they may be readily attached to the miniature station hoarding. As an alternative the posters may be mounted on special poster boards fitted with two lugs that can be attached easily to fencing and to bridges.

The Hornby System is particularly well equipped with accessories in the shape of lineside structures of various kinds. There is the signal cabin, which can be arranged to accommodate the lever frame, or in the case of electric layouts, the controller; there are stations and goods platforms, where heavy traffic can be dealt with; and there are the imposing Engine Sheds for the housing of the locomotives. Among the smaller accessories, the watchman's hut and the platelayer's hut are particularly effective, and have proved extremely popular on account of their realistic appearance.

Another notable introduction is a series of train name boards and destination boards. By means of these boards the various expresses of the Hornby Series may be appropriately named, the most famous trains of the four groups being represented. The improvement in the appearance of miniature trains brought about by the use of these boards is quite remarkable.

Many of the Hornby accessories, such as the engine sheds, goods platform, signal cabins, signals and buffer stops, have recently been suitably wired and fitted for electric lighting. It thus becomes possible to illuminate a miniature layout on realistic lines, the signals in particular having a most fascinating appearance.

As the result of widespread requests we have recently extended our range of tunnels, with the special object of assisting the owners of railways that have to be taken up and stowed away each time after use. These tunnels are made in various lengths, and special features are the curved tunnels in the form of a small hill through which the track runs obliquely. These may be obtained either with a right-hand or a left-hand curve, so that they are suitable for any layout.

Still another innovation that will add enormously to the appearance of any model railway is a series of cuttings. These also are made in a variety of sections. There are end sections, sloping down realistically to ground level, and centre sections to be inserted between these end sections, thus enabling a cutting to be extended to any desired length. The centre sections are also made in curved form.



XXXI.—A POLICE OFFICER

A POLICE force is a necessity in every civilised country, and bodies of this kind have existed in Great Britain since Saxon times. The watchmen, constables and other officials who formerly kept order and arrested criminals and lawbreakers in the towns and parishes of the kingdom were not very efficient, however, and the first really satisfactory police force was the Bow Street Patrol, the members of which were usually called the "Bow Street Runners." This force was formed in 1745, and was a step towards the introduction of modern police methods.

The first police force of the kind with which we are familiar came into existence in 1829, when Sir Robert Peel introduced "An Act for improving the Police in and near the Metropolis." The official title of Metropolitan Police Force was given to the new force, and to-day its members number nearly 21,000, and patrol an area of about 700 sq. miles. Later similar bodies of police were formed in the boroughs and counties of England and Scotland, and a semi-military force known as the Royal Irish Constabulary was established in Ireland.

Although the police forces of this country are directly controlled by local bodies through special committees, they work under regulations laid down by various Acts of Parliament and, through the Home Office, the Government exercises close supervision in order to ensure efficiency. All are organised on similar lines. Except in the Metropolitan Police Force, the officer in charge is known as the Chief Constable, and the men under his command are grouped in divisions, each headed by a superintendent, who is assisted by a chief inspector. Each division consists of a number of sub-divisions under the control of sub-divisional inspectors, and each sub-division contains police stations, the number depending on the size and population of the district covered. Police stations are in charge of inspectors, station-sergeants, or sergeants, according to their importance, and the men attached to them are distributed into sections, each being under the control of a sergeant.

The Metropolitan Police Force differs slightly in organisation from other police forces of the country. Its chief is known as the Commissioner. It is not necessary that he shall have followed the career of a policeman, the qualifications chiefly looked for being organising ability and power of maintaining discipline. Many distinguished soldiers have occupied the position, the present Commissioner being Lord Trenchard, who was largely responsible for the organisation and development of the Royal Air Force, the most recent addition to the Services. Under him Assistant-Commissioners superintend the work of the Chief Constables, one of whom is in charge of each of the various divisions and special branches into which the force is divided.

With the exception of certain high officials of the Metropolitan Police Force and Chief Constables of other forces, all who wish to take up a police career must begin as ordinary constables. Candidates must be within certain age limits, usually between 20 and 26 years, and they must be healthy and of a minimum height and chest development. An Act of Parliament of 1921 gives 5 ft. 8 in. as the minimum height, with chest measurement in proportion, but the requirements of different police forces vary. In many instances applicants must be at least 5 ft. 9 in. in height, and in other cases the standard is higher, the average height throughout the country being 5 ft. 10 in.

A candidate for admission to the police force must give evidence of having been reasonably well educated. This usually means that he must be proficient in the subjects taught in elementary schools, and emphasis is laid on general intelligence. Again the requirements of different police forces vary, and in certain instances an examination may be set in order to test the ability of the applicant.



Mr. A. K. Wilson, Chief Constable of the Liverpool City Police Force. Mr. Wilson entered the police service in 1909 as a constable at Cardiff. He rose rapidly to the rank of Staff-Inspector in the Chief Constable's office, and in 1928 was appointed Chief Constable of Carlisle. A year later he became head of the Plymouth Police Force, and while holding this position he displayed courage and resource in subduing the recent riot in the Prison at Dartmoor. He was appointed Chief Constable of Liverpool in January of this year. Photograph by courtesy of the "Liverpool Daily Post and Echo."

In addition to possessing these qualifications, a young man wishing to join the police force must be able to produce satisfactory proofs of good character. If he thinks he is eligible, he should ascertain the requirements of the police force that he wishes to join, and having made certain that his qualifications are in order, he then should send his application to the Chief Constable. When doing so, he should give details of any special qualifications he may possess, for the work of a constable covers a very large field, and ability to undertake tasks out of the ordinary routine is a great advantage. No effort should be spared to make the application complete and to ensure that all the requirements are thoroughly complied with, for competition for admission to the police forces of this country is very keen, and only the best men are accepted. In addition, there is usually a long waiting list, and a considerable time may elapse before a suitable applicant secures admission. This is particularly the case at present, because the need for economy has caused recruiting throughout the country to be either suspended or slowed down.

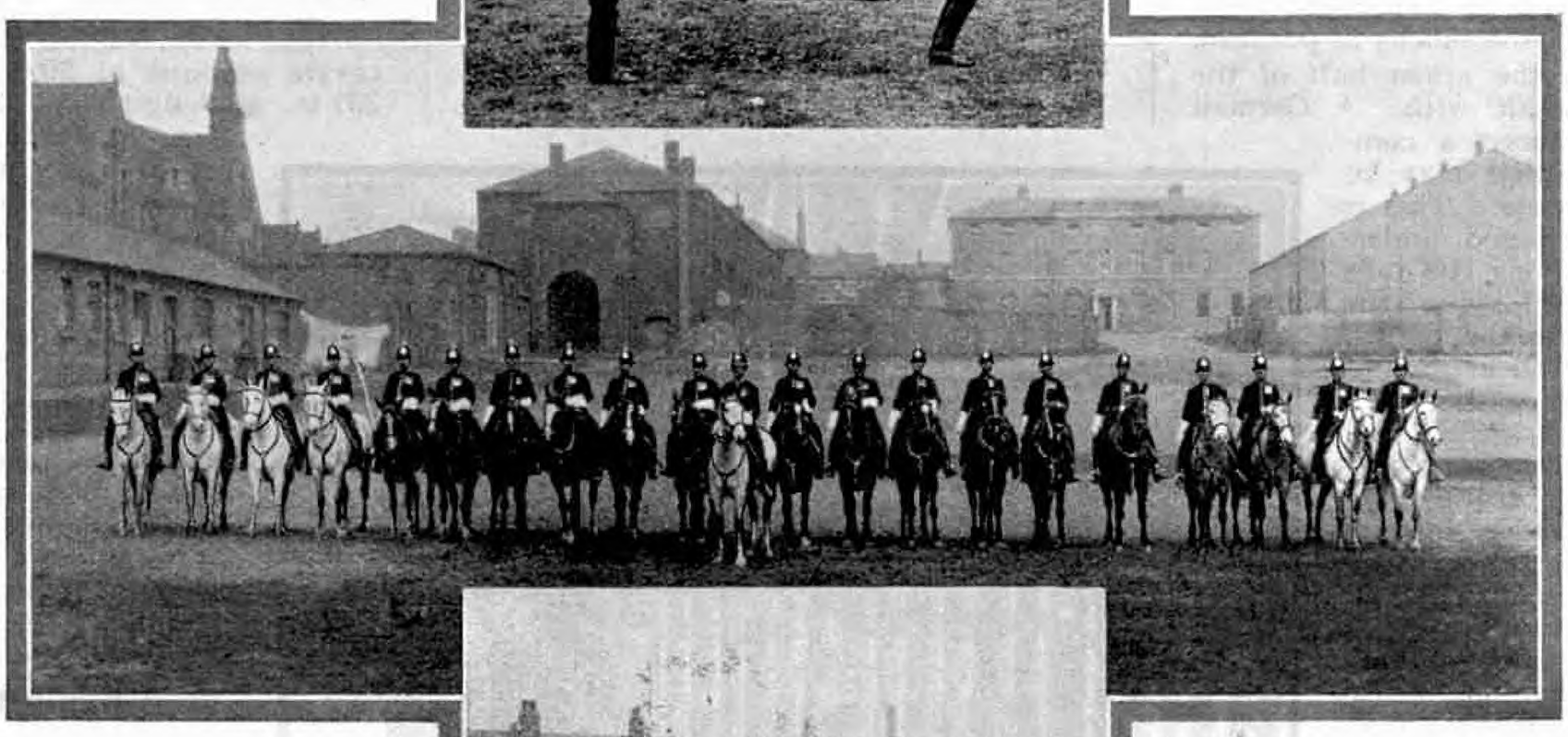
Appointments as constables are made subject to a probationary period of two years, and if in the interval the probationer does not make the requisite progress, his services may be dispensed with. During the preliminary period recruits go through a course of training, either at headquarters, or at centres devoted to this purpose. The courses at police training schools are very thorough, and the progress of the men is carefully checked from time to time. For instance, training at the Metropolitan Police Training School begins with educational classes for recruits who have not attained a sufficiently high standard. Then comes a course of training in police duty, and also in first aid, self-defence, physical training and other subjects likely to be of value. The entire course is divided into sections, and each man must pass in any one section before he is allowed to go on to the next. This period of training usually occupies about three months, and on its completion the probationer is attached to a division of the active police force. Even then he continues his training, receiving instruction daily from a specially appointed inspector. At the end of six months he is again brought back to the school, where he is examined by an independent Board.

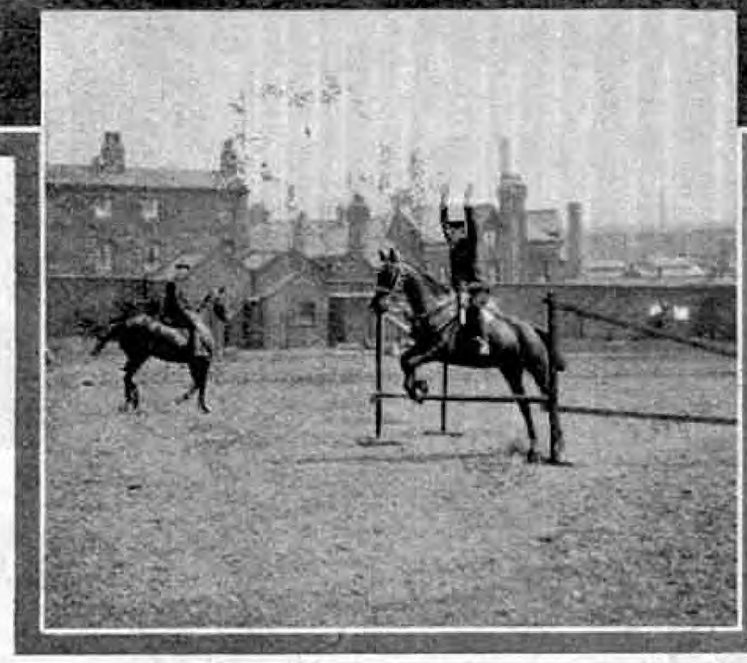
There are also excellent police training schools at Birmingham and Manchester, and probationers from other police forces are received there for a course of ten weeks' training in all police duties. They do outdoor patrol work and are examined weekly, and while at the school are treated as members of the Birmingham and Manchester forces respectively.

Promotion is not a matter of seniority, but of merit. A constable who has served for five years, and whose conduct has been satisfactory, is eligible for promotion, but this period may be shortened for those who possess special qualifications. It also is necessary to pass an examination, which usually is partly oral and partly written, and includes papers on police duties in addition to questions in school subjects and general knowledge. Passing the examination is a necessary qualification, but does not entitle an officer to promotion, this depending on his merit as a constable, and on his ability to take charge of men or to further the interests of the force in some special branch of work.

Men with a good education should secure promotion fairly rapidly, for they should have no difficulty with the necessary examinations and they are likely to have special qualifications. For instance, they may be fitted for detective work. This constitutes an important part of the activities of the Metropolitan Police Force, the C.I.D. or Criminal Investigation Department, with its headquarters at New Scotland Yard, being famous all over the world. Its members are only recruited from the ranks of the Metropolitan Police Force, and those who aspire to join it therefore must first be enrolled as constables. Probationers are watched in order to see if they show suitable powers of observation and reasoning, and if they seem promising are afterwards told off for plain clothes duty. If their work is satisfactory they are told to apply for entry to the C.I.D. Then follows an interesting training in criminal detective work, and a special examination must be passed before the candidate becomes a recognised member. Pay in this branch is the same as that of the uniformed police, but certain detective and plain clothes allowances are made. Other police forces carry out similar work on a smaller scale, of course.







Mounted police training in progress at the City of Birmingham Police School. Our photographs are reproduced by courtesy of Mr. C. H. Rafter, Chief Constable of Birmingham.

The mounted branch of a police force offers an excellent opportunity to those who have a thorough knowledge of horsemanship. Small detachments of mounted men are maintained in most large forces, and an interesting recent development is the establishment of traffic patrols, the members of which must know how to maintain and repair motor cycles and motor cars. In certain instances river detachments are attached to police forces. This is notably the case with the Metropolitan Police Force, the Thames police forming an important section of this body. Its members must first serve as ordinary policemen, and their applications to the Superintendent of this branch should be backed up by a knowledge of swimming, rowing and of rivercraft generally.

A further activity closely connected with police work is fire-fighting. The Fire Brigade in a city, county or other smaller area may be a separate organisation, or it may rank as part of the police force, being under the command of the Chief Constable. If it is a part of the police force, its members receive standard pay in addition to special allowances. Those wishing to join a Fire Brigade that is a separate body must address applications to the Superintendent at the Central Fire Station. For instance, applications for admission to the Fire Brigade of the London County Council must be made to the Chief Officer of that force at Southwark Bridge Road, S.E.

The members of a police force are subject to strict discipline, and their progress depends very largely on their observation of the rules laid down, and their capacity and willingness to obey orders. Their work calls for tact, courtesy and patience, but they must always be alert and tenacious. The duties vary considerably, ranging from patrol work to employment in special investigations, and in all cases are highly responsible in character. The normal tour of duty is eight hours, this being exclusive of any time spent in parading for service or waiting to be relieved, for no constable may leave his post until his successor is at hand.

The pay normally received by a probationer is 70/– per week. At the end of the probationary period this is increased to 72/– per week, and a further annual increase of 2/– weekly brings this to 90/– weekly at the end of ten years' service. A sergeant receives 100/– per week on promotion, and periodic increases of 2/6 lead to the maximum of 112/– per week after five years' service in this rank. The pay of an inspector varies from 122/9 to 193/– per week, and that of a superintendent from £450 to £700 a year, depending in each case on the class of appointment held. The salaries of Chief Constables also show large variations, those who control the forces of large cities or counties receiving much higher pay than the men holding similar positions in smaller areas.

It should be noted that the changes made last year in the interests of national economy have reduced the pay of constables by 4/3 weekly, and that of sergeants by 5/6 per week. Similarly the pay of entrants is now 55/–, while the salaries of those holding higher rank have been reduced by five per cent. It is understood that these reductions are temporary, and that they will be reviewed when financial conditions permit.

Members of the police force are also granted allowances in respect of uniform and boots, and when engaged on special duties. In addition, every member is provided either with a house or quarters, or is given an allowance towards rent, the amount of this allowance depending on his rank. Free medical attendance is provided, and holidays on full pay are allowed. Further, there are pensions on a liberal scale. After serving 25 years a constable may retire on half-pay, or he may stay in the force until he has completed 30 years' service, his pension then being two-thirds of the pay received at retirement. An officer who has completed ten years' service or more, and is compelled to retire through ill-health, also is entitled to a pension on a lower scale, and a gratuity is awarded to men who retire for similar reasons after less than 10 years' service. The nature of his tasks makes it necessary to give a member of a police force special protection from the results of an injury, and if he should be rendered unfit for service as a result of an injury arising in carrying out his duties, he receives a pension for life, the amount depending on the degree of disablement. Pensions also are granted to widows of officers who die after completing five years' service. It will be seen that the special character of the work of the police is recognised by a complete system of safeguards and guaranteed awards..

So far we have been dealing with the *Continued on page 441*



Crane Driven by Compressed Air

When tunnels are being lined with heavy pre-cast blocks of concrete, the lack of room in which to work often makes it difficult to place the blocks in position, particularly when the upper half of the tunnel is being dealt with. A German engineer has produced a compressed air crane that may be used for this purpose. This is mounted on a wheeled underframe that runs along the rails usually laid down for the carriage of materials in the tunnel, and is provided with a jib that can be lengthened or shortened as required.

When the crane is in operation, only two men are required to carry out the work of lining a tunnel. The crane is controlled by one of them and lifts each block into place, while the second workman stands on an elevated platform in order to guide it into its exact position. Blocks up to 330 lb. in weight may be lifted by the crane, and even with unskilled labour may be laid at an average speed of one a minute.

Electric Power from French Canal

Early this month an interesting hydro-electric power station at Kembs, Alsace, is to be opened by the President of the French Republic. This station has been built at one of the locks of the Alsace Canal now being constructed from Basel to Strasbourg to enable river traffic to avoid difficult navigation on the Rhine between the two cities. A dam has been built across the Rhine about three miles from the Swiss frontier in order to give the necessary depth of water to the canal. When the waterway is finished it will have eight locks, and at each one a power station is to be built, the total output from which will be 650,000 kw.

The head of water available at Kembs will vary from 13 ft. to 18 ft. Six turbo-alternators are being installed in the station, which will have a total capacity of 186,000 k.w.

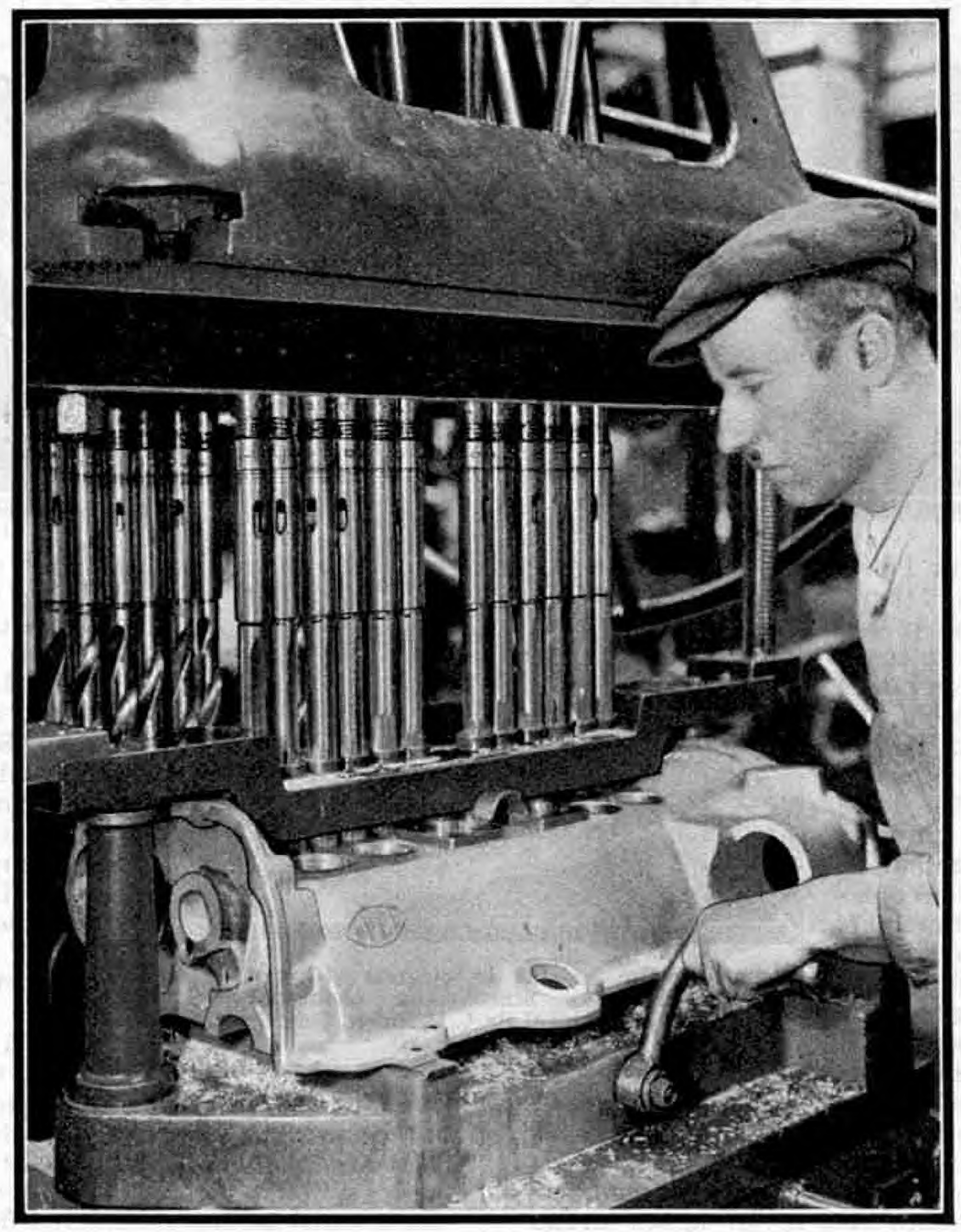
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It is announced that a high-level bridge is to be built at Brisbane, Queensland. This will span the Brisbane River at Kangaroo Point, and is expected to cost about £2,000,000.

L.M.S.R. Bridge Reconstruction

The L.M.S.R. timber bridge over the River Nene between Peterborough North and Peterborough East station is to be replaced by a steel structure, to be built by Braithwaite & Co., Engineers, Ltd. The bridge will carry a double track and will be supported on twelve riveted steel cylinders. There will be about 650 tons of steelwork in the bridge.

A contract has been awarded to the same firm for about 250 tons of heavy plate girders and stanchions that are required for reconstruction work on the bridge that carries the line of the L.M.S.R. over the L.N.E.R. track at Horn's Bridge, Chesterfield. The work of erecting the bridge will be carried out by the railway company's own staff.



A stage in the mass production of motor cars. The machine shown bores and cotters 12 holes in two operations.

All-Welded Steel Building in London

The steel frame of a building now being erected in London has been joined together entirely by welding, not a single rivet having been employed. The building covers an area of 30,000 sq. ft. and is 231 ft. in length and 160 ft. in width.

A large clear floor space was desirable, for the building will be used to house machinery; and this has been obtained by giving it a roof with a span of 160 ft.

The building is divided into 33 bays, and in its construction 22 ordinary trusses and 110 of cantilever type have been used. These are placed at intervals of 13 ft. 2 in. and are suspended from six girders that in turn are supported on 12 braced columns. There are more than 130 tons of steel in the framework of the building.

Giant British Planing Machine

An engineering firm at Johnstone, near Paisley, have recently completed a planing machine that is thought to be one of the largest ever constructed in this country. The machine has been built under contract for a Russian firm, and is to be employed in machining turbine casings required for a large Russian hydro-electric power scheme.

The planer weighs about 200 tons and is capable of taking work measuring 36 ft. by 13 ft. The driving motor develops 80 h.p., while the motor that gives the traversing movement is of 12.5 h.p. Lubrication is on the forced-feed system, and motors developing from one to three h.p. drive the pumps required for this purpose.

Clocks that Announce the Time

In order to avoid being disturbed by telephone subscribers who ring up to ask for the correct time, the authorities of the Paris Observatory have installed a number of talking clocks that actually announce the time to the nearest 10 seconds. A subscriber who wishes to take advantage of the new scheme asks his exchange for a certain number, and is automatically placed in communication with one of the clocks. It is claimed that the Paris Observatory is the only one equipped in this manner.

Electric Tramcars Travel at 60 m.p.h.

A new type of high-speed electric tramcar has been introduced on certain routes at Schenectady, in the state of New York. The cars are low and are carefully streamlined, and in front their roofs slope downward and their sides curve inward to meet in a point. They have a maximum speed of 60 m.p.h. on the level, and may be accelerated as rapidly as a powerful motor car. Even when travelling at high speed, however, they may be pulled up in a few yards by means of the special pneumatic and magnetic brakes fitted to them.

Each car is 47 ft. in length and provides accommodation for 48 passengers. Special attention has been paid to ventilation, and the air passing through each car enters at the floor level and passes through heaters before reaching the passenger accommodation. Spent air is withdrawn through ducts in the roof.

The new vehicles are very light, and in spite of their high maximum speeds require less electric power for operation than tramcars of older type. They are designed to be operated by one man, who opens the doors in front and at the rear when necessary by pressing a handle. Passengers may enter only through the front door, but may leave at either end of the car.

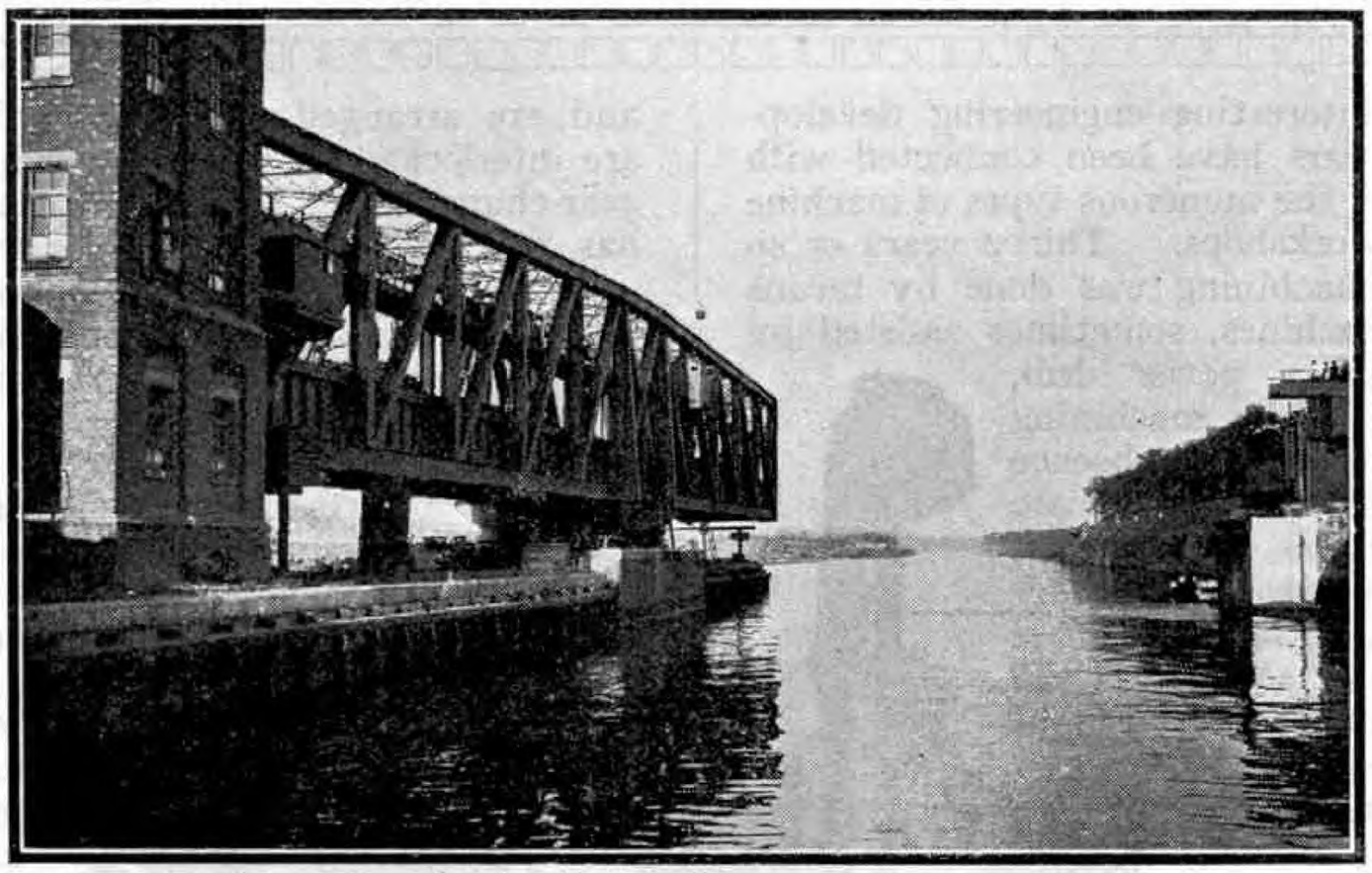
Hoisting Engine for South African Mine

Although it is unusual for a compound condensing engine to be employed for hoisting men, a large new engine of this type is being constructed by a Chesterfield engineering firm for service of this kind in the Daggafontein Mines in South Africa. Engines of this type are not usually so employed because in the event of loss of vacuum in the condenser, a cage that is dropping to the bottom of the shaft can only be stopped by the main post brakes. The engine for South Africa, however, is fitted with a special secondary braking system that makes an accident almost impossible if the vacuum should break down.

The engine has been designed to raise a load of 10,000 lb. from a vertical depth of 4,200 ft. at a maximum speed of 3,500 ft. per minute. It will not be required to operate at this speed, however, for ore will be raised at a speed of 3,000 ft. per minute, and with men in the cage, the speed will only be 2,600 ft. per minute. It is estimated that the cage will accelerate from rest to its maximum speed in 20 secs.

New Aluminium Alloy

An interesting alloy known as " aldrey," containing more than 98 per cent. of aluminium, with small proportions of iron, magnesium and silicon, has been produced by German engineers. The alloy has a tensile strength of about 44,000 lb. per sq. in. and its melting point is over 1,200°F. It may be pressed and welded readily, but its most remarkable feature is its high electrical conductivity, for in this respect it is said to be as valuable as copper, the metal now employed for electrical transmission lines. In addition the alloy resists corrosion, and therefore is particularly suitable for use on transmission lines near the sea.



The Barton Aqueduct, which carries the Bridgewater Canal over the Manchester Ship. It replaced a stone aqueduct built by James Brindley in 1761, and in our photograph is shown open to allow shipping to pass along the Ship Canal.

Light Tank Crosses Wide Ditches

A light tank capable of crossing ditches of a width greater than its own length has been introduced. The tank has short poles hinged on projecting arms in front and rear, and when it reaches a ditch that cannot be crossed in the ordinary way, the front pole is pushed out so that it comes into contact with the opposite bank. The tank is then driven forward until the treads are gripping the earth on the opposite side of the ditch, and as it moves on, the rear of the machine is prevented from falling by the action of the pole at the rear. Streams and ditches 8 ft. 6 in. in width have been crossed in this manner, although the widest gap that can be negotiated by a light tank of ordinary size is 4 ft. 6 in.

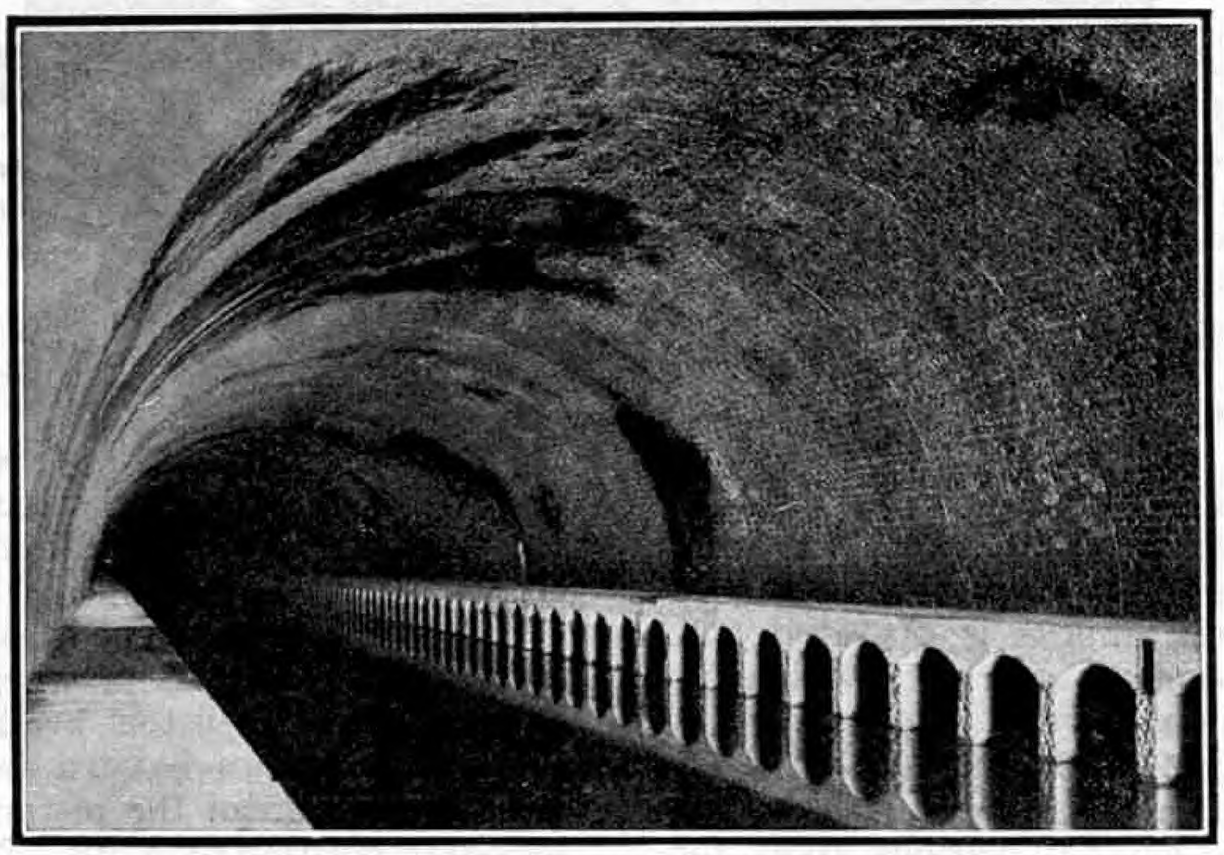
Samples of Soil Pulled up by Crane

It is often necessary to obtain information concerning the sub-soils of districts in which building or engineering operations are to be carried out, and an interesting method of securing samples has been developed by an American company. Two steel girders are employed, shaped in such a manner that when placed side by side they form a closed casing. They are driven into the ground separately, the second being sunk alongside the first, and are then pulled up together. The core of earth brought up between them may be examined in detail, the positions and thicknesses of the strata bored through being clearly shown.

The new method has been employed in investigating various soils, including peat and clay. The greatest depth to which the girders have so far been driven in trials is 40 ft., and a crane capable of developing a pull of about 75 tons has been employed to raise them.

* * * *

The contract has been awarded for the first section of the work of enlarging the Grand Union Canal. This consists of the widening of locks between Warwick and Birmingham.



A view of the interior of the longest tunnel in France, through which passes the canal from Marseilles up the valley of the Rhone. The tunnel, which is 4½ miles in length, was completed in October 1926.

New York's Skyscrapers

New York is rapidly developing into a city of skyscrapers. A little more than three years ago there were in the city 40 structures with more than 30 storeys, but by the beginning of 1932 the number of buildings of this size had increased to 93, while nearly 500 structures had at least 20 storeys.

The highest building in New York, and in the world, is the Empire State Building, which has 86 storeys and is 1,250 ft. in height. The world's highest skyscraper three years ago was the Woolworth Building, which is only 767 ft. in height, and thus is little more than half as tall as the present record-holder. There are now three other buildings in New York taller than the Woolworth Building.

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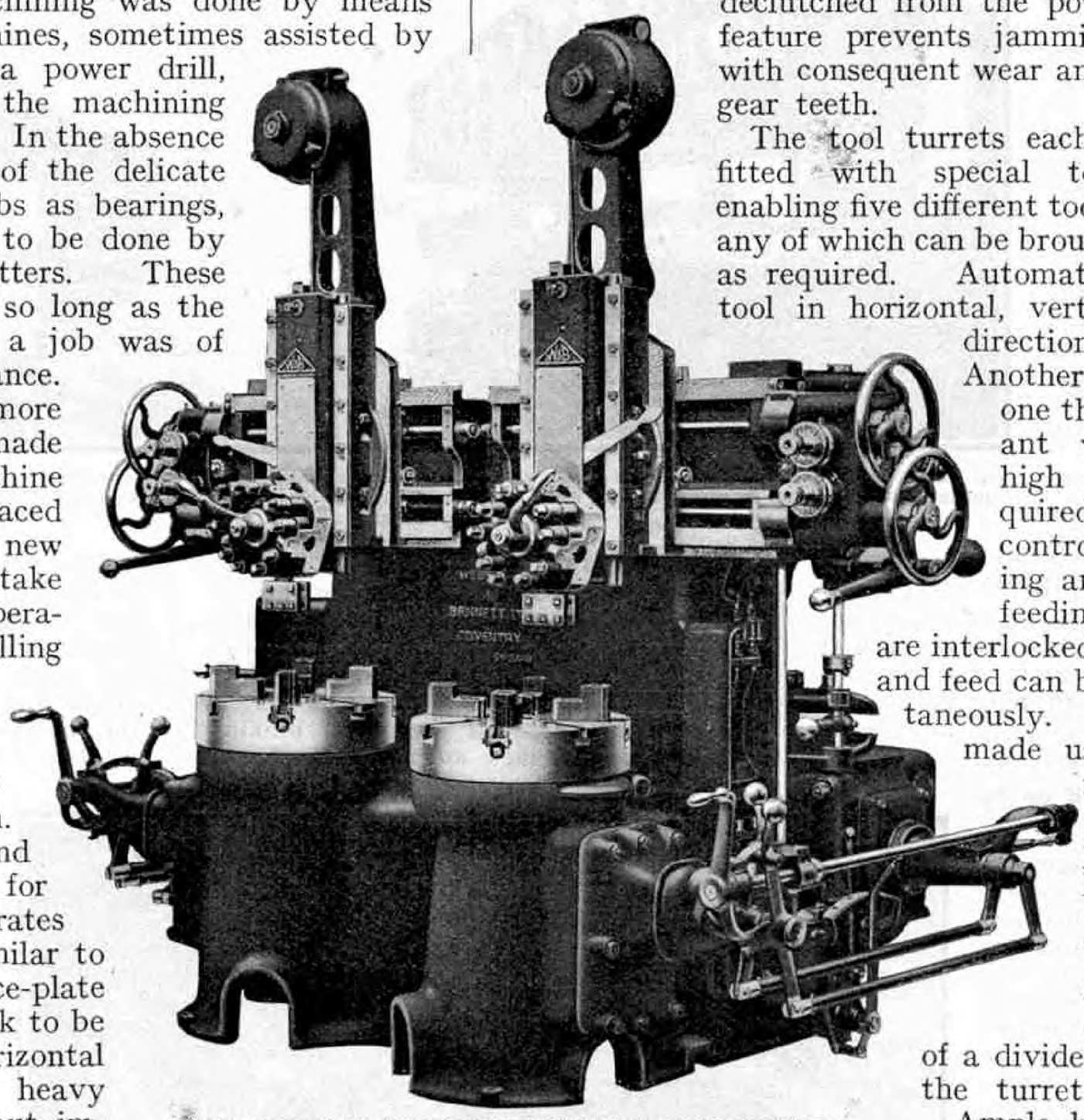
A Clydeside shipbuilding firm is at present building a floating dock for service in South Africa. The dock will be 250 ft. in length and will be shipped to its destination in sections and not towed out complete.

A Duplex Boring and Turning Mill

Doing Two Independent Jobs at Once

SOME of the most interesting engineering developments in recent years have been connected with the improvement of the numerous types of machine tools used in modern workshops. Thirty years or so ago almost all metal machining was done by means of lathes, and these machines, sometimes assisted by a planing machine and a power drill, undertook practically all the machining carried out in many shops. In the absence of special machines most of the delicate finishing work on such jobs as bearings, eccentrics and valves had to be done by hand by highly skilled fitters. These methods were satisfactory so long as the time taken to carry out a job was of comparatively little importance. As the need for larger and more economical output has made itself felt, however, machine tool makers have been faced with the task of designing new types of machines to undertake more or less specialised operations such as boring, milling and gear cutting.

An interesting example of one of these modern machines is shown in the accompanying illustration. It is a duplex boring and turning mill designed for heavy-duty work. It operates in a manner somewhat similar to a lathe, except that the face-plate or chuck, in which the work to be machined is held, is in a horizontal position, thus allowing heavy work to be handled without imposing any undue shearing strain on the face-plate holding-down bolts or the bearings.



A Duplex Boring and Turning Mill built by Webster & Bennett Ltd., of Coventry, to whom we are indebted for our illustration.

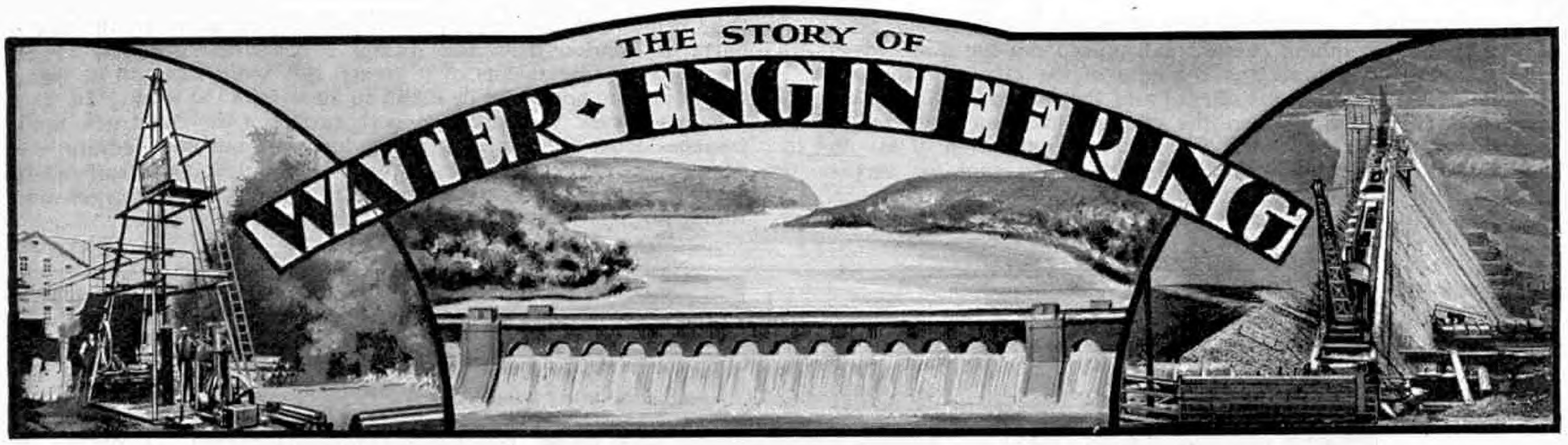
The machine is of the two-chuck type and can carry out two independent jobs simultaneously. To enable this to be done, each of the chucks is operated and controlled from an independent gearbox, which in turn is driven from the main drive. Each chuck is served by a specially-designed type of slide-rest equipped with a tool-box or tool-holder. The latter is of the rotating turret head type, so that various tools for rough cutting, finishing, etc., can be inserted for operation in succession. Each chuck is driven by spur gearing designed to overcome any tendency on the part of the chuck to lift in its bearings when the tool is taking a heavy cut. Directly underneath each chuck is a heavily-built V-shaped pressure ring that takes the downward thrust produced on the chuck when a heavy casting is being machined.

A particularly good feature of this machine is the speed-change gearing that controls the speed of the chucks. The gears are made of nickel-chrome steel and are arranged in geometrical progression. They are interlocked so that the machinist cannot move the gear-change lever to effect a change in speed until he has first made sure that the main driving pulley is declutched from the power drive. This feature prevents jamming of the gears, with consequent wear and perhaps broken gear teeth.

The tool turrets each have five faces fitted with special tool-holders, thus enabling five different tools to be attached, any of which can be brought into operation as required. Automatic feeding of the tool in horizontal, vertical and angular directions is provided. Another good feature, and one that is very important when continuous high production is required, is that the gears controlling the traversing and the automatic feeding of the turrets are interlocked, so that traverse and feed can be operated simultaneously. This feature is made use of when it is required to cut a tapered bore in a job. For the latter work too, the tool can easily be set at the required cutting angle by means of a divided scale fitted on the turret swivel.

Ample lubrication is provided through a simple system of siphon tubes, which carry filtered oil to all the bearings. The speed and feed gears are lubricated on the splash system.

A machine of this type is especially useful in a modern locomotive repair shop, where it is often used in the machining of a piston head casting. Piston heads for steam engines have a tapered bore that fits over the tapered end of the piston rod, the head then being locked in position by a nut. Without machines specially adapted for the purpose, the cutting of this bore is a long operation requiring great care and accuracy in its execution. On a Duplex machine, however, the bore of one head can be machined on one chuck simultaneously with the cutting of the piston ring grooves in a second head by the other chuck and turret. The two heads are then simply changed over from one chuck to the other, and the remaining work on each head is then completed. Locomotive wheels and piston rings are other examples of work that can be done in record time on a machine of this kind.



II.—LONDON'S WATER SUPPLY

IN the previous article in this series we told how the Romans obtained abundant supplies of water for their cities by constructing long conduits to collect the water and convey it from the hills to the cities. Where a valley intercepted the route they carried the conduit across it on a stone structure known as an aqueduct, and we described some of these great aqueducts that still exist in Italy and Spain.

In Britain, as in almost every other country that the Romans occupied, many traces of their engineering skill remain, but there is no evidence that they constructed any large aqueducts here. Local streams and wells seem to have provided sufficient water to meet the requirements of the small communities, but some additional source of supply must have been necessary in the important cities, such as Londinium (London), where large garrisons and houses were established and public baths maintained. The water obtained from outside sources was conveyed through culverts or surface conduits into the cities, and there distributed through further surface conduits or lead pipes.

It would take many pages of the "*M.M.*" to relate in full the history of water engineering in Britain, and in this article we shall confine ourselves to the story of London's water supply. Whatever system the Romans employed to distribute water to the inhabitants of London soon fell into disuse after their departure, and until well into the 13th century Londoners obtained their supplies of water partly from streams that flowed near to or passed through the city, and partly from shallow wells sunk into the sands above the chalk. During this long period the population of London increased considerably, especially after the Norman Conquest, when many Normans settled in the city; and by the early part of the 13th century the supply of pure water obtained from the wells had become quite inadequate.

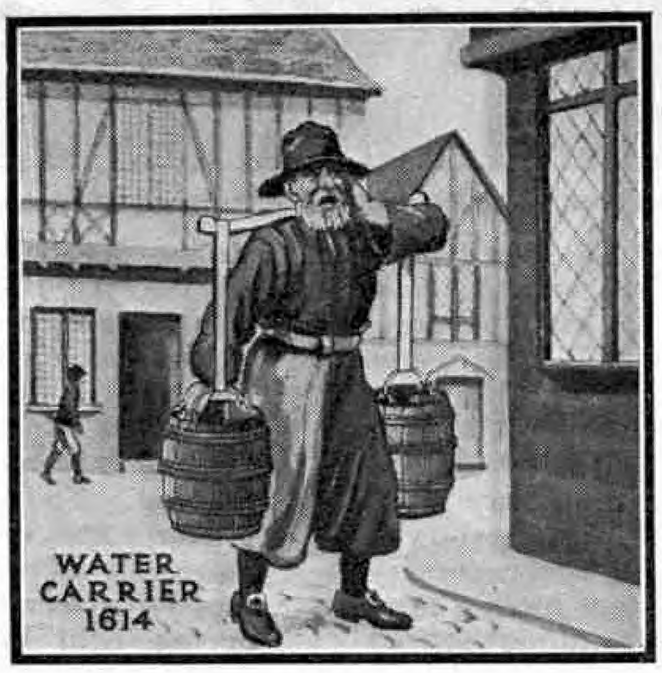


Sir Hugh Myddelton.

In London, as in other cities, the Corporation were responsible for providing an ample supply of water, and in 1236 they obtained the consent of Parliament to construct a conduit to convey water from springs "in the manor of Tyburn." The Royal assent granted "to the citizens and their successors liberty to convey water from the manor of Tyburn by pipes of lead into their city." The document adds that the proposed conduit was "for the profit of the city, and the good of the whole realm thither repairing; to wit for the poor to drink, and the rich to dress their meat." The date of the laying of the conduit is given variously as 1237 and 1245. The conduit terminated in a building called the Great Conduit House that was built at the Poultry end of Cheapside, and the cost of the work was met by a levy on the inhabitants of Cheapside and the Poultry. A. S. Foord, in his book "*Springs, Streams and Spas of London*," describes the conduit house as "a long and low stone building, battlemented, and enclosing a large leaden cistern, the water of which issued from a cock into a square stone basin at the eastern end."

Later conduits were constructed to bring water from springs in Hampstead, Highbury and other districts, and eventually there were nine conduits in use in London. In these conduits the water of a spring was led into a tank in a building erected either close to or actually over the spring. From the tank the water passed into the conduit and flowed through this to the distributing base, which, says Foord, "might be from one to three miles distant. Here the water was stored in a receptacle of great capacity, and drawn from cocks or taps, as it was required. No mechanical contrivance was used either to raise the water into the cistern or to accelerate its passage through the pipes. All depended upon the very slight downward gradient necessary to ensure a steady flow of water; and indeed this fundamental principle of gradient was the only known method of water conveyance in the Middle Ages." Once every year the Lord Mayor and Aldermen made a tour of inspection of the conduits.

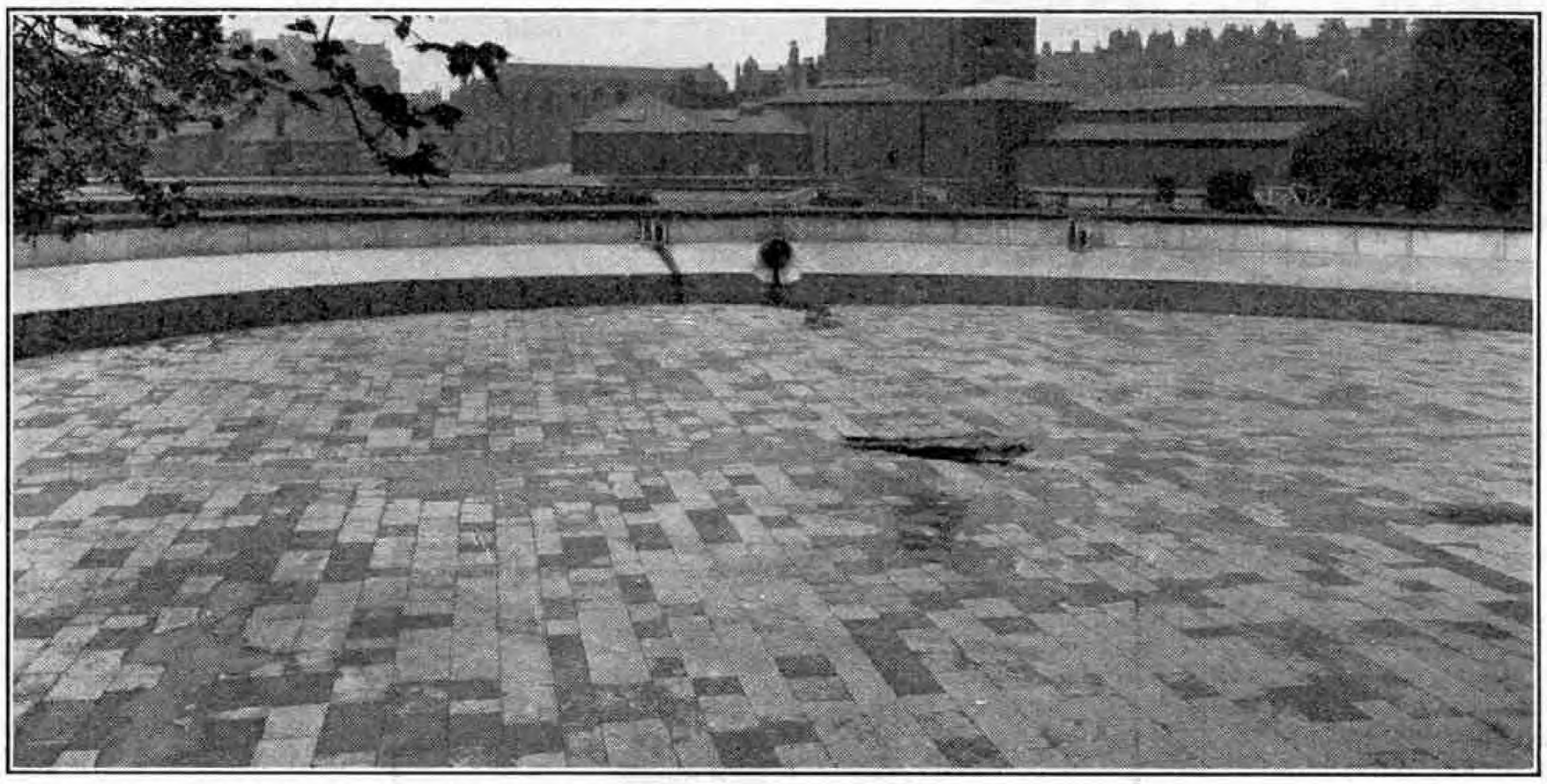
In addition to drawing water at the conduit houses the people could obtain supplies from hawkers known as "water carriers," who filled their tankards at the same source. A tankard was a cone-shaped vessel with a small iron handle at the neck by which it could be carried easily on the shoulders. It has a capacity of about three gallons, and was fitted with a bung to prevent the water from splashing out as the vessel was being carried. Larger quantities were drawn from the Thames and carried in wooden tubs called "tynes," two of these being hung from a pole slung across the carrier's shoulders. The water drawn from the Thames was far from pure owing to the accumulation of dirt on the banks of the river; in fact the water was polluted to such an extent that in 1345 the carriers who filled their vessels at Dowdgate Dock ceased to draw water until the dock had been cleaned. In other parts, however, the river continued to be polluted, and in 1357 King Edward III addressed a sharply worded letter on the subject to the Mayor and Sheriffs of London.



During the 15th and 16th centuries additional conduits were constructed to cope with the demand of the growing population. The Corporation watched very carefully over their conduits and severely punished any person found interfering with the flow of water through them. In 1478 they discovered that William Campion, a resident in Fleet Street, had cunningly tapped a conduit laid past his door so that some of the water flowed into a well in his house. Campion was brought before the Lord Mayor and Aldermen and afterward kept in gaol for some time. In "*Lives of the Engineers*" Smiles relates that Campion was then "set upon a horse with a

vessel like unto a conduit placed upon his head, which being filled with water running out of small pipes from the same vessel, he was taken round all the conduits of the city, and the Lord Mayor's proclamation of his offence and the reason for his punishment was then read. When the conduit had run itself empty over the culprit, it was filled again." On completion of his unpleasant tour Campion was marched back to gaol for further detention.

Although it was illegal, the practice of laying short pipes from the conduits into private houses gradually increased, and the amount of water that reached the conduit houses diminished accordingly. This state of affairs led to frequent disputes between the water carriers for precedence in filling their tankards. Sometimes these disputes developed into riots, and at length the Lord Mayor intervened and forbade anyone visiting the conduits armed with clubs and staves. This restriction did not make good the shortage of water, however, and as time went on the need for additional supplies became greater.



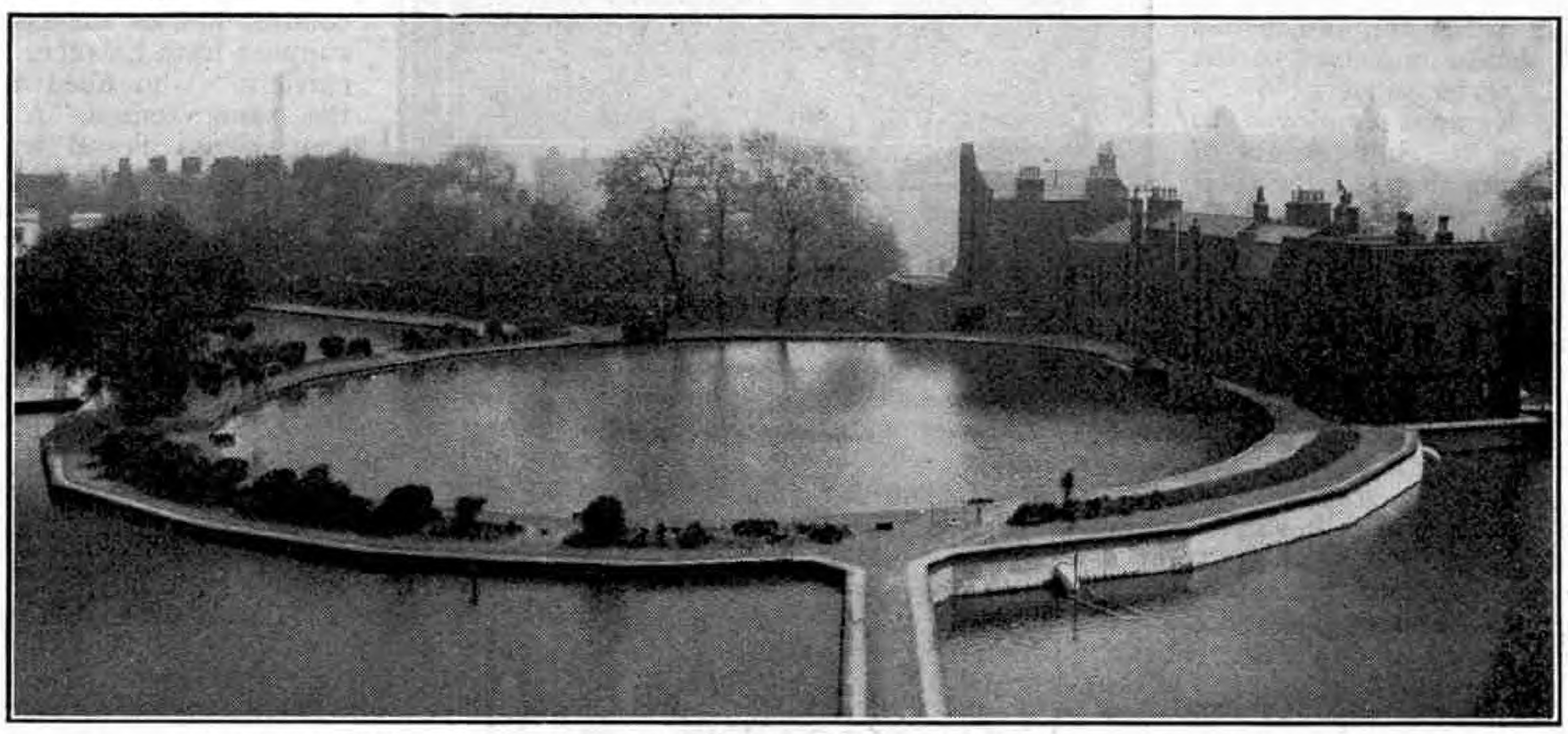
The stone paved floor of the Round Pond constructed by Sir Hugh Myddelton in 1613. For the illustrations on this and the opposite page we are indebted to the courtesy of the Metropolitan Water Board.

In 1582 a Dutchman named Peter Morice undertook to convey water from the Thames to the city inhabitants by mechanical means, and the Corporation readily gave him permission to make the attempt. Morice erected in the first arch of the London Bridge an ingenious pumping engine operated by a water wheel driven by the rise and fall of the tide, which rushed through the arches with considerable velocity. The engine forced the water through leaden pipes which were laid to the various houses. His contrivance succeeded beyond expectations, and at a public demonstration of its efficiency Morice astounded the Lord Mayor and Aldermen of the city by throwing water over St. Magnus's steeple! The machinery worked so well, in fact, that a few years later the engineer was authorised to use the second arch of the bridge for the same purpose.

Morice's machinery was not adequate to supply all the water needed, however, and toward the end of Queen Elizabeth's reign the Corporation obtained an Act authorising them to cut a river from any part of Hertfordshire or Middlesex. Ten years was allowed by the Act for the work to be carried out. Many plans were considered but no river was cut, for the Corporation showed little inclination to provide all or even a part of the necessary funds, and the Act lapsed without any practical steps having been taken. In 1605 another Act was obtained. This one authorised the Corporation to conduct a stream of pure water to the north parts of London from the springs of Chadwell and Amwell in Hertfordshire by means of a trench not more than 10 ft. wide, but at first no one could be found to undertake the work. In 1606 a man named William Inglebert proposed to construct brick trenches from the springs to London, but nothing definite was decided. Two years later a Captain Edmond Colthurst offered to carry out the scheme, but on being informed that the Corporation would not share any of the cost he withdrew his offer.

The prevalence of fever among the population added to the urgency of the project, and the prospect of the citizens continuing to suffer indefinitely from a shortage of pure water greatly troubled Hugh Myddelton, Member of Parliament for Denbigh, who had developed a special interest in proposals to improve London's water supply. Finally he lost patience at the repeated delays of the Corporation, and declared boldly: "If no one else will undertake this work, I will do so, and execute it at my own cost." He undertook to complete the work in four years.

Myddelton's offer was a courageous one, for he was not an engineer, an architect or even a builder, but simply a goldsmith. Beginning his career as an apprentice of the Guild of the Goldsmiths' Company, in London, he eventually established a business of his own in what is now Basinghall Street. The business of a goldsmith in those days was one of great importance and dignity, and Myddelton's shop appears to have become quite a fashionable place of resort. Among his clients Myddelton numbered King James I, who on one occasion purchased for Queen Anne a jewel costing £250. According to an interesting tradition handed down for many generations, Myddelton and Walter Raleigh used to sit together at the door of the former's shop and smoke the newly-introduced weed, tobacco. Their action created considerable amazement among passers by, who stood in groups to watch!



Another view of the Round Pond. The Metropolitan Water Board Offices now stand on part of the site.

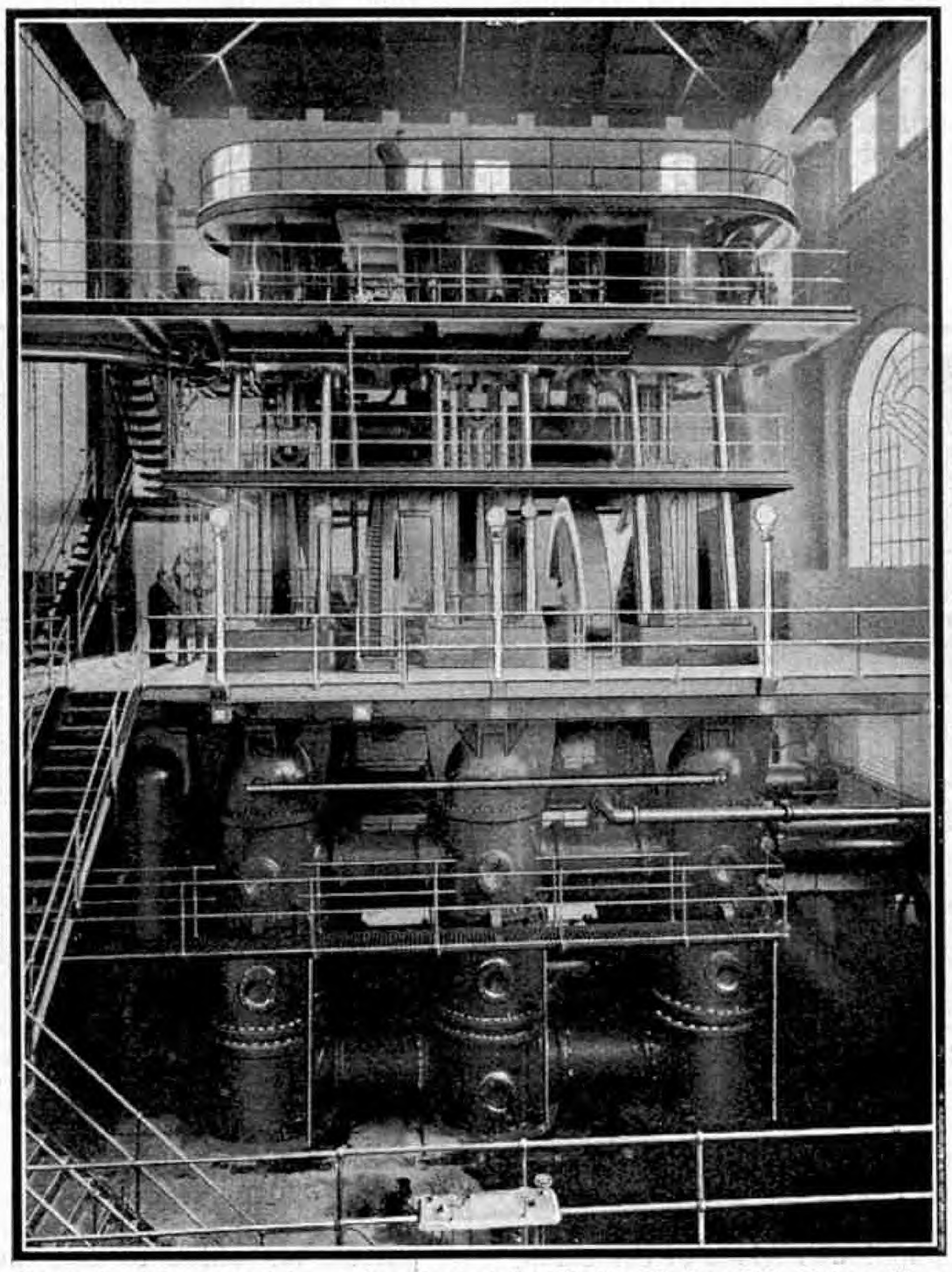
When the Corporation learned that Myddelton was prepared to stand the expense of the project himself, they ignored the fact that he was merely a goldsmith, and readily authorised him to proceed. They were, in fact, only too glad to hear of someone venturesome enough to take on the job. An agreement was signed by Myddelton and the Corporation in April, 1609, and shortly afterwards excavations were begun at the Chadwell Spring, near Ware.

An unexpected trouble now arose. The occupiers of land to be entered upon by the " New River " strenuously opposed the work, declaring that their meadows would be turned into marshes, that their farms would be " mangled " and their fields cut up into small pieces. They argued that the New River would be no better than a deep ditch, equally dangerous to men and cattle, and that heavy rains would most certainly cause it to overflow and flood their lands. Parliament proved unable to settle this determined opposition and the trouble increased to such an extent that by 1612 the whole scheme was threatened with disaster.

In desperation Myddelton appealed to James I for support. The route of the New River lay through the Royal Park at Theobalds, where probably the King had seen the men at work. At any rate Myddelton was favourably received and after some discussion the King resolved to support the project. An agreement, so long that it covered seven skins, was duly drawn up and signed, in which the King undertook to share half the cost of the whole scheme, and also granted Myddelton a right of way through any of the Royal Estates upon which it might be found necessary to encroach in carrying out the works.

The distance from Ware to London is only about 20 miles, but the New River when finished was nearly 40 miles long. This additional length was the result of the attempt to maintain the river as much as possible at the level of the Chadwell Spring, and at the same time to avoid deep cuttings and large embankments. In order to do this it was necessary to follow a winding course around the hills, crossing each valley at the most favourable point. The fall of the stream averaged about 2 ft. per mile. Where this proved to be inconveniently rapid a stop-gate, from 3 ft. to 4 ft. in height, was erected across the stream, the water passing over this to the lower level.

The embankments and valley crossings were from 8 ft. to 10 ft. in height, the earth excavated on the higher side of the cutting being used to build up the bank on the lower side. In some cases these earthworks intercepted the passage of surface water to the river Lea, the natural drain of the district. Where this occurred the drainage water was conveyed under the New River in culverts, or over it by what were called " flashes." The flashes consisted of wooden troughs about 12 ft. in width and 3 ft. in depth extending across the river.



One unit of the powerful pumping plant at the Walton Works of the Metropolitan Water Board. This triple expansion engine is designed to pump 17½ million gallons per day against a maximum head of 267 ft.

The New River was constructed with an average width of 10 ft. and was crossed by more than 150 bridges. An important item in the scheme was the building of the Bush Hill Aqueduct near Edmonton. There the New River was carried over a stream flowing from Enfield Chase by means of a brick arch that carried a strongly timbered lead-lined trough. This trough was 660 ft. in length and 5 ft. in depth and contained 80 brick piers 2½ ft. in height, upon which were erected stout timber posts 6 ft. in height. Cross timbers were laid and strengthened by intermediate uprights. A similar aqueduct was erected on the embankment near Islington. This was 460 ft. in length and 17 ft. in height and was nicknamed " Myddelton's Boarded River."

At Islington the New River passed through a tunnel of considerable length and emerged at the reservoir named the " New River Head." Previously this had been an unused pool known as the " Ducking Pond," and Myddelton enlarged it and made a proper embankment.

The opening of the flood-gates at the Islington Reservoir was carried out on 29th September, 1613, with great ceremony. The inrush of the pure water was greeted by the cheers of thousands of enthusiastic spectators, mingled with the firing of guns, the pealing of bells and the sound of trumpets and drums. In appreciation of the completion of this valuable work the King conferred upon Myddelton the honour of knighthood.

The New River Company distributed the fresh water by means of some 400 miles of wooden piping laid through the London streets. The pipes consisted of tree trunks bored to a diameter of about 7 in. At the large end of each pipe the hole was enlarged to form a conical socket, and the small end was cut to the shape of a cone so that it fitted neatly into the broad end of the preceding length of pipe. Generally elm trunks were used, as this wood can be exposed to water or damp earth for a long time before rotting. The New River Company's pipes as a whole, however, were affected seriously by weather conditions, and although the mains were shut off every night to prevent waste as much as possible, the loss of water by leakage during the daytime and by pipes bursting under pressure was estimated by the Company's engineer to amount to almost a quarter of the total water distributed through the system. Ultimately the wooden pipes were replaced by pipes made of cast iron.

For a long time people remained prejudiced against water that had been brought through pipes of any kind. The water carriers, realising that they were in danger of losing their trade, naturally made the most of this public fear, and hawked their fresh water with cries of: " Fresh and fair New River water. None of your pipe sludge ! "

The part played by the King in the making of the New River was brought back to him a few years later in a rather unpleasant manner. While he was out riding one winter day at Theobalds, accompanied by his son Prince Charles, his horse stumbled and fell, throwing him headlong into the New River which was thinly frozen over at the time. The King disappeared under the ice until only his boots remained visible. He was promptly hauled out and was able to ride back to the palace, three miles away, where he quickly retired to bed. Although he was none the worse for the mishap, the King regarded it as due to negligence on the part of Myddelton and the Corporation of London in not properly fencing off the river.

For just over 100 years the New River Company was the only company by which water was supplied to London. During that period many miles of piping was laid underground, an important additional supply of water was obtained from the River Lea, and large reservoirs were constructed. In 1721 or 1723 the Chelsea Water Company was formed and began to supply water from the Thames to Westminster and the neighbouring districts. This company is best remembered as having laid the first cast iron water main in London. This pipe was 1 ft. in diameter and was laid during 1740 at a cost of £2,740.

Other water companies came into existence at irregular intervals, and by 1823 eight companies were systematically supplying water to the inhabitants of London. Some of these companies drew water from the Thames as far down as Battersea and London Bridge, but in 1852 an Act was passed that compelled all the London water companies utilising Thames water to obtain it from the river above Teddington Lock, the tidal limit of the river. The care of the river above this point is entrusted to the Thames Conservancy, who see that the water is not polluted by factories or by sewage.

Early in 1904 the undertakings of the eight London water companies passed to the Metropolitan Water Board, which since that time has controlled the whole of London's water supply. The Board have continued to develop the water supply and to-day the area of supply exceeds 560 square miles, and the distribution system includes 7,322 miles of pipes. Additional reservoirs have been built from time to time, and the 49 storage reservoirs now in use have a total capacity of 19,657 million gallons, or sufficient to supply the whole world with a gallon of water per head for 10 days. This figure is an increase of 15,541.3 million gallons over the storage reservoir capacity when the Board assumed complete control in 1904.

Artists of Prehistoric Times

Paintings and Carvings on Walls of Caves

THERE must be very few people who are not interested in the races that inhabited the earth in the days before history.

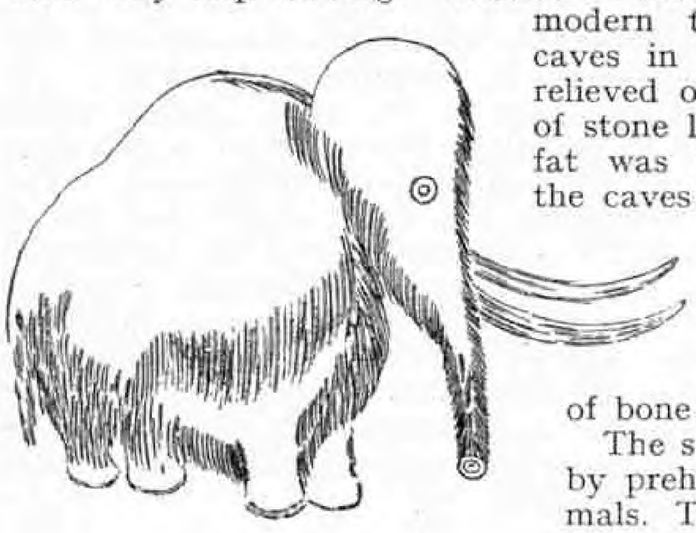
Naturally we know very little about them, for their remains consist for the most part only of a few bones and tools dug out of layers of earth and gravel that have hidden them for centuries. These have been discovered in many parts of the earth, and are occasionally turned up during digging and excavation work, every find adding to our knowledge of people of bygone ages. The task of trying to reconstruct the daily life of the people who lived thousands of years ago from these relics has led to many surprising and fascinating results.

The implements used by the early inhabitants of the earth are particularly interesting. The earliest-known men used tools and weapons made of bone or stone. For example, they fashioned beautifully sharp and efficient needles from small fishbones, and learned to make useful axes by binding sharp-edged flints to wooden handles by means of thongs of skin or hide. They were very skilful in chipping flints in order to give them keen edges, and because of the great use they made of stone, the era in which they lived has been called the Stone Age.

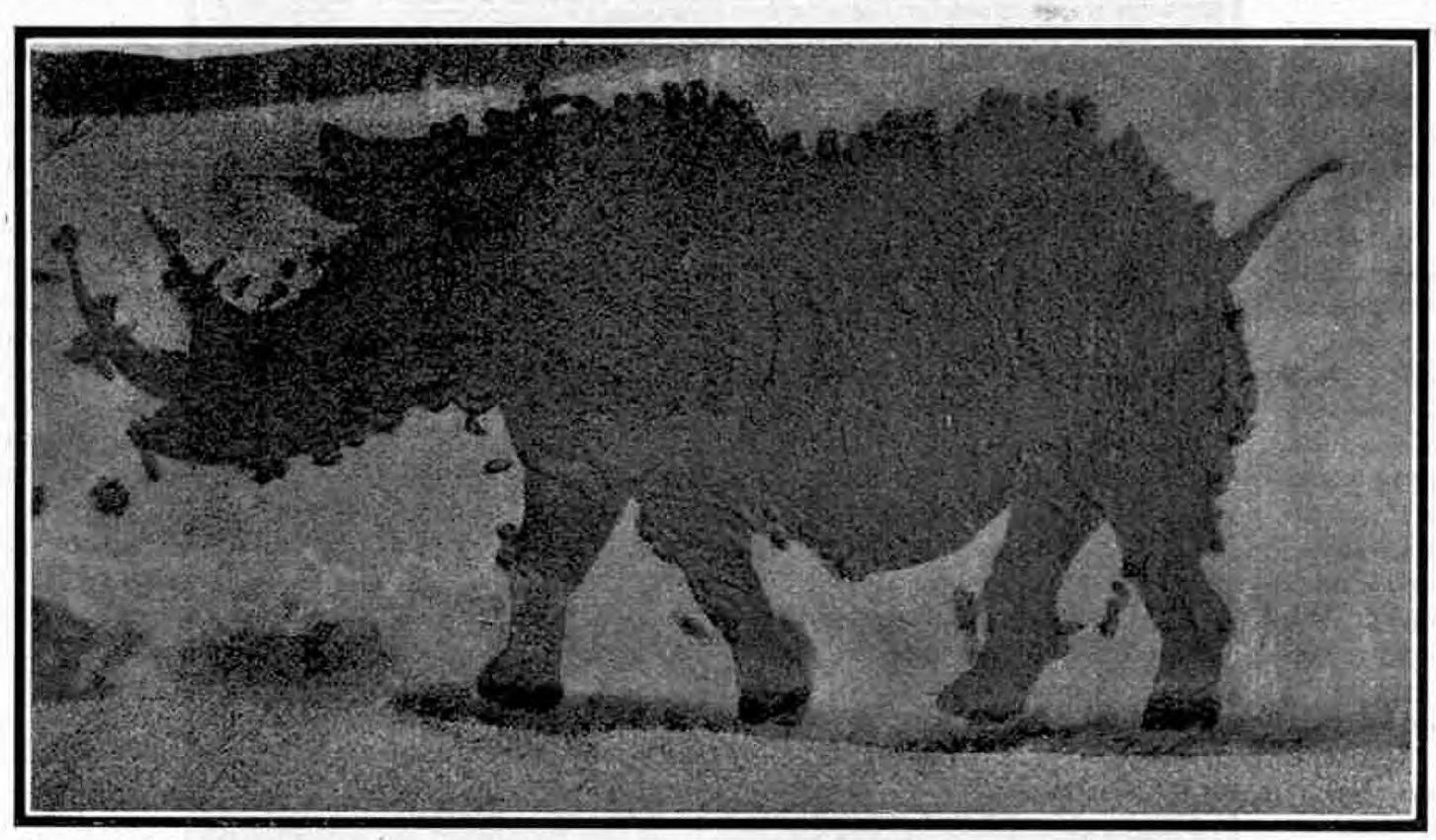
We do not know for certain how long this Age lasted or when it began. In certain parts of the earth it may almost be said to exist to this day, for the savage tribes of Central Australia and the Eskimos of the far north are dependent upon resources similar to those of the earliest inhabitants of Europe. In this country, and in most of the populous regions of the earth, the Stone Age was brought to an end by the discovery of copper and bronze, materials that were far more suitable than flint for making tools. The Bronze Age that followed was eventually replaced by the Iron Age, in which we may still be said to be living.

It is so long since the men of the Stone Age ruled the earth, and we have so little knowledge of their resources, that we are apt to look upon them as a race of ignorant savages. But it is very doubtful if they were quite so uncivilised as we may be inclined to think. They appear to have been organised into communities, and the surprising discovery has been made that in certain districts they developed wonderfully artistic tastes and showed great skill in expressing them.

Naturally the materials with which these early artists worked were very unpromising. Instead of the well-lighted studios of modern times, they had dark caves in which the gloom was relieved only by the feeble light of stone lamps in which marrow fat was burned. The walls of the caves served as canvases for the painters, and on them figures in relief also were carved by sculptors provided with crude tools made of bone or flint.



The subjects chiefly favoured by prehistoric artists were animals. These they have depicted with astonishing skill, and their paintings, drawings and carvings are full of vigour and action. In fact, they are so good that when they were discovered many people could scarcely believe them to be of ancient origin. There is very little doubt, however, that they were made long before the beginnings of history. This is clearly shown by the romantic manner in which one of the most famous of the caves containing them was discovered. In 1868 a hunter of Altamira, in northern Spain, ran a fox to earth. When he attempted to dig it out he was astonished to find that he had uncovered the entrance to an extensive cave system. The nature of the soil that he dug out proved that for thousands of years access to the caves had been completely prevented, and yet within them there may be seen one of the most remarkable series of rock paintings and sculptures yet discovered.

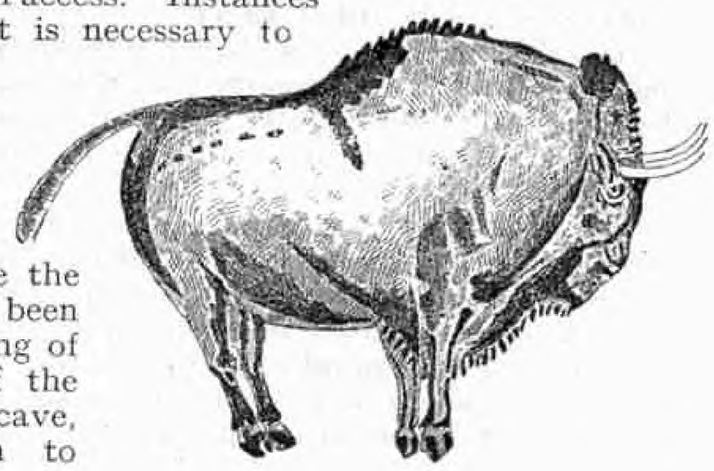


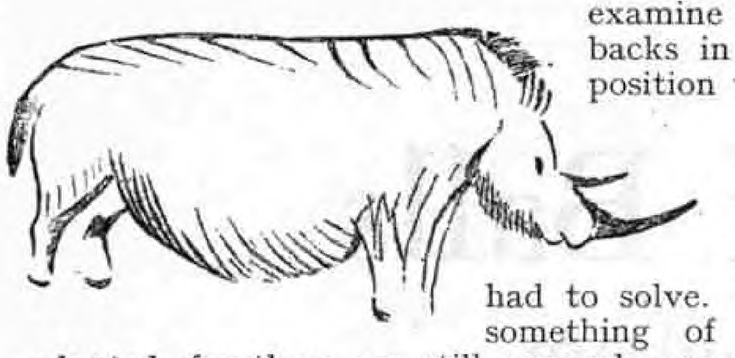
A wonderful rock carving from South Africa, showing a white rhinoceros accompanied by tick-birds. The unknown artist is believed to have lived thousands of years ago. For this illustration and the similar one on the opposite page we are indebted to Mr. C. J. Swierstra, Director of the Transvaal Museum, who discovered the interesting carvings shown in them.

In many other instances excavations in caves have been necessary in order to uncover the paintings, and centuries must have passed in the accumulation of the deposits under which the works of the unknown artists had been buried. For example, in a cave in the Pyrenees, elaborate carvings, and the actual stone tools with which they may have been executed, were found at the bottom of a layer of soil and debris on the floor, and with them the skeleton of a man of the Stone Age. It is quite reasonable to assume that the sculptor himself had died in the cave in which he had carried out his work, and that the skeleton was his.

Those who worked in colour undoubtedly used a rough form of palette on which to mix their paints. These were made from marrow fat, with which earths of various kinds were mixed in order to produce different colours. The chief materials used were iron ores, the colours of which were red, orange, brown and yellow. A black pigment was usually formed by mixing charred bones or similar material with the fat, although in some instances the mineral known as pyrolusite was used for this purpose. In the early days of Stone Age artistic development these represented the entire colour range. Later a white paint was made by grinding up kaolin, or China clay, with marrow fat in exactly the same manner as was done in preparing other colours. These were stored in hollow marrow bones until required, and many of these ancient paint tubes have been found with remains of the pigments still in them.

It is curious to find that many of the most impressive of the paintings and sculptures of these ancient artists were made in places that were very difficult of access. Instances are known in which it is necessary to squeeze sideways through very narrow openings in order to find the rock surfaces on which painting or carving has been done. In one remarkable case the work actually has been carried out on the ceiling of a very low portion of the farthest corner of a cave, and those who wish to





examine it must lie on their backs in order to wriggle into position to see it!

It is clear that the provision of good means of lighting was one of the problems that Stone Age man had to solve. Fortunately we know something of the means that he adopted, for there are still men who use similar means. These are the Eskimos. Since coming into contact with modern civilisation, the conditions under which these people exist have greatly improved, but many of them use lamps made of stone in which they burn marrow fat with the aid of a wick made of moss. Finds made in the caves inhabited by the Stone Age men of Europe show that they also used lamps of this kind, but more commonly they burnt the fat in rough vessels made from the skulls of animals.

It is not easy to say why the drawings and paintings were made. At first thought it might be supposed that they were done purely for ornamental purposes, but the curious positions in which some of them are found, and their strange nature, suggest that a simple form of magic was involved in them.

The chief European centres of the art of the prehistoric cave men are Southern France, the Pyrenees, and Northern Spain. On the walls of caves in these three districts may be seen drawings of mammoths, bison, lions, bears and other creatures that to-day are found only in other climates, or actually are extinct. These drawings are vigorous and life-like, as may be seen from the examples reproduced on these pages, and the fact that the animals represented in them have been unknown in France and Spain for thousands of years is a further proof of the antiquity of the drawings.

The animal that figures most prominently in the pictures of prehistoric artists is the bison. To-day this is found only in North America, where less than 100 years ago millions of bison roamed the prairies. The animal must have been of great importance in prehistoric Europe during the Stone Age. Probably the men of that time depended very largely on it for food, and many of the most spirited drawings they made actually show bison hunts in progress. But the artistic spirit and vigour is confined to the representations of the animals, for curiously enough these ancient artists did their worst work when they tried to draw human beings.

Among other animals represented in the rock paintings of bygone ages are the horse and the chamois. Fishes also were familiar to the prehistoric race to which the artists belonged, and salmon and trout may be recognised in their works. Birds are seldom included in the pictures.

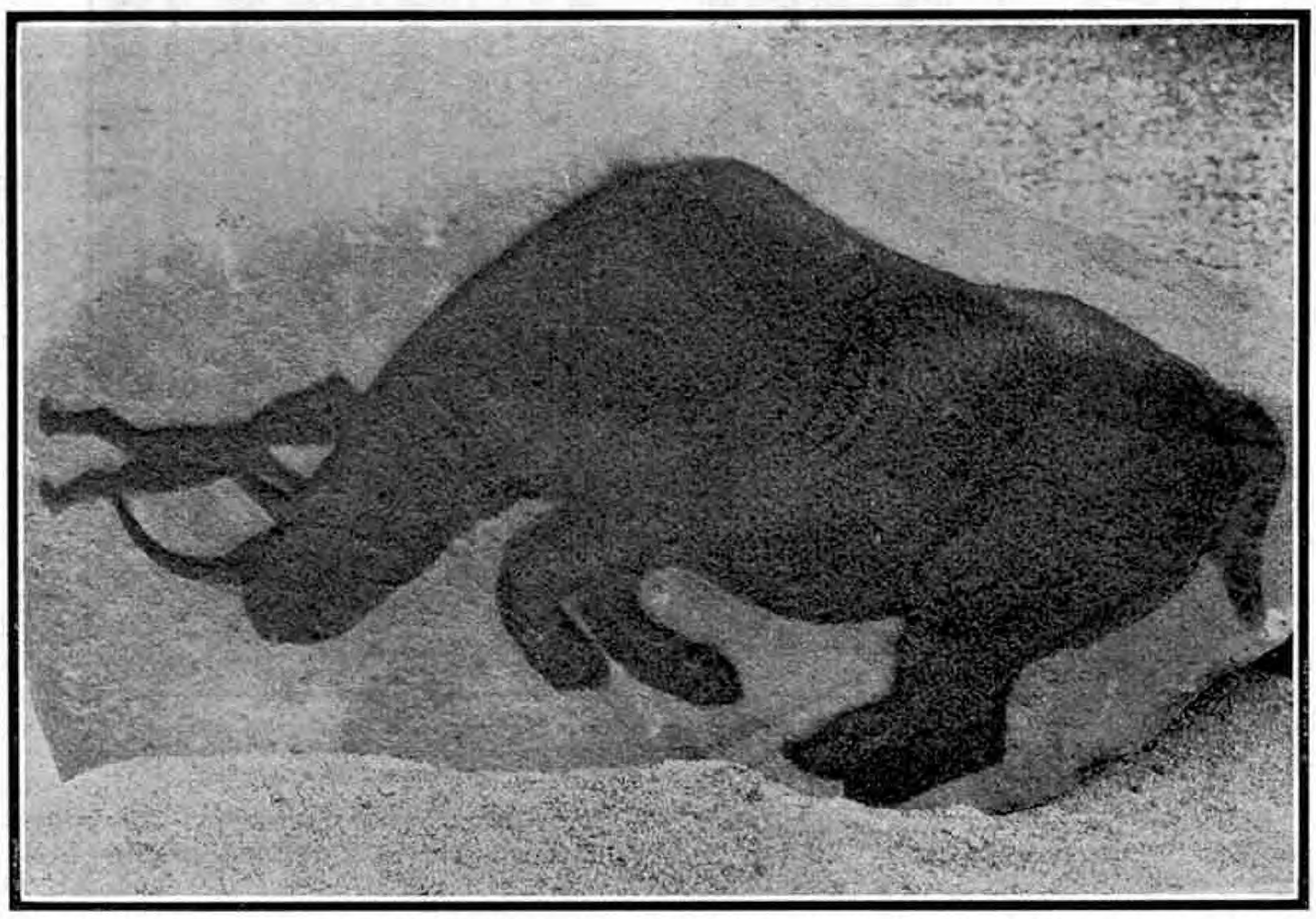
So far we have dealt only with Europe, but in South Africa also remarkable prehistoric work is found. In various parts of that country, from Rhodesia in the north to the mountainous districts in the south, there are peculiar ridges of overhanging rock known by the name of "krans." These form the typical rock shelters in which the prehistoric inhabitants of the country lived, and prehistoric paintings and carvings are found on their walls. The greatest number of these, and those in which the greatest skill has been shown, are found in caves overlooking the larger rivers of the country.

The materials at the disposal of the South African artists were very similar to those employed in Europe. Their pigments were mineral ores of various colours, and were prepared for use by grinding them to powder and mixing them with animal fat. Apparently the outline of a design was first drawn with a burnt stick, and the paint then smeared on the rock by means of a crude brush made of feathers or specially prepared animal tendons. As a rule the entire design is filled in with colour, but sometimes the outline is traced in a different tint.



The South African rock paintings reflect the daily life of the race to which the artists belonged. They include representations of domestic occupations, and hunting incidents and symbolic dances are prominent among the subjects illustrated. The pictures of animals are drawn most realistically, and there is no difficulty in recognising in them elephants, lions, giraffes, wilde-beest, antelopes and other creatures that are characteristic of South Africa at the present day. The drawings are by no means primitive in character, but show as high a standard of intelligence and artistic taste as those found in the caves occupied by the prehistoric inhabitants of Europe. In fact, the resemblance between the two series of paintings is so striking that a common origin has been suggested for the races responsible for them.

In Africa much of the work takes the form of rock carvings, or petroglyphs. As our large illustrations show, these are particularly magnificent. The two reproduced were discovered in 1908 in the South Western Transvaal by Mr. C. J. Swierstra, now Director of the Transvaal Museum. The artists who executed them were evidently familiar with the animal life of their time, for each of the carvings depicts a type of rhinoceros in a strikingly lifelike attitude. One of them shows a black rhinoceros in the act of tossing a boy into the air. There can be little doubt that the carver of this remarkable petroglyph had actually seen an incident of this kind, for the picture enables us to imagine the whole episode. It is quite clear that the animal has charged with lowered head and by a vigorous effort is about to throw the boy upward.



A rock carving showing an exciting incident of prehistoric days in the Transvaal. It represents a black rhinoceros throwing a boy into the air with a swing of its enormous head.

The other petroglyph is even more remarkable. It represents a white rhinoceros attended by tick-birds. These are small white birds, a little larger than pigeons, which in certain portions of Africa follow cattle and other animals in order to prey on the parasites that infest their bodies. The petroglyphs undoubtedly were carved thousands of years ago, but it is quite clear that the human beings who then inhabited South Africa were familiar with the remarkable habits of these birds.

Formerly it was thought that the paintings and rock carvings discovered in South Africa were the work of the ancestors of the Bushmen, a race of small but hardy hunters and trappers that remained in undisturbed possession of South Africa for many centuries. They were not attractive in appearance, for they had broad noses and projecting jaws, and their limbs seemed incapable of carrying the weight of their bodies. They lived on the animals they shot with primitive bows and arrows, and on edible roots and plants, for they knew nothing of agriculture, and had no permanent homes. The race began to decline when other negro tribes entered South Africa from the north. About 100 years ago Bushmen were still fairly numerous in the Cape Provinces and in the Orange Free State, but to-day very few remain, and it is necessary to visit caves in remote parts of the country, such as the Kalahari desert, in order to find them.

It has always been a matter of some surprise that the ancestors of the Bushmen should have produced such magnificent art treasures as the rock paintings and carvings of South Africa, for the present-day representatives of the primitive inhabitants of the country are so degenerate that it is impossible to imagine them ever to have been possessed of artistic taste and skill. Examination of fossilised skulls and other remains

(*Continued on page 462*)

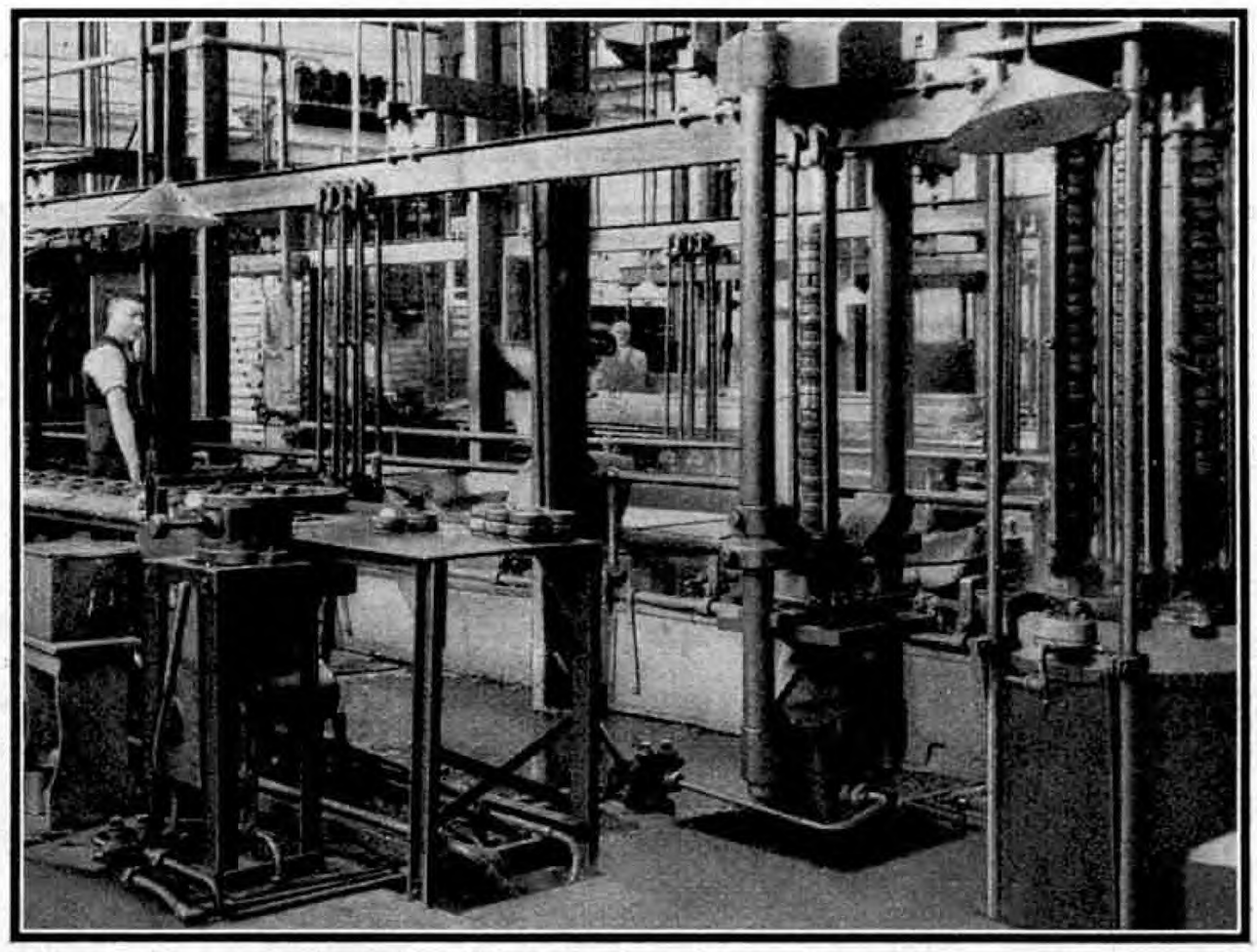
HOW THINGS ARE MADE

Rubber Cored Golf Balls

The Dunlop Works at Birmingham

IF an attempt were made to estimate the relative popularity of various games, there is no doubt that golf would stand very high in the list. To-day this game is an international recreation, and is played by young and old alike.

Scotland is the traditional home of what is often called "the royal and ancient game," and it was so popular there more than 500 years ago that the Scottish Parliament decreed that it should be "utterly cryit doune." The authorities were troubled because so much time was devoted to golf and football, and strongly recommended that archery practice should be substituted for what were then regarded as undesirable recreations! But it was impossible to prevent the spread of golf, and this definitely became the national game when it found favour with the Stuart kings. James VI was a noted golfer, and it is recorded that in 1618 he gave a monopoly of ball-making in Scotland for 21 years to one James Melville. The price of Melville's balls were not to exceed 4/–, a large sum in those days; and any balls found not to bear the authorised maker's mark were liable to confiscation.



Columns of the moulds in which golf balls are given their final shape. The moulds enclosing the balls are lowered into hot water for a short time in order to make the gutta percha coverings plastic. For the illustrations to this article we are indebted to the Dunlop Rubber Co. Ltd.

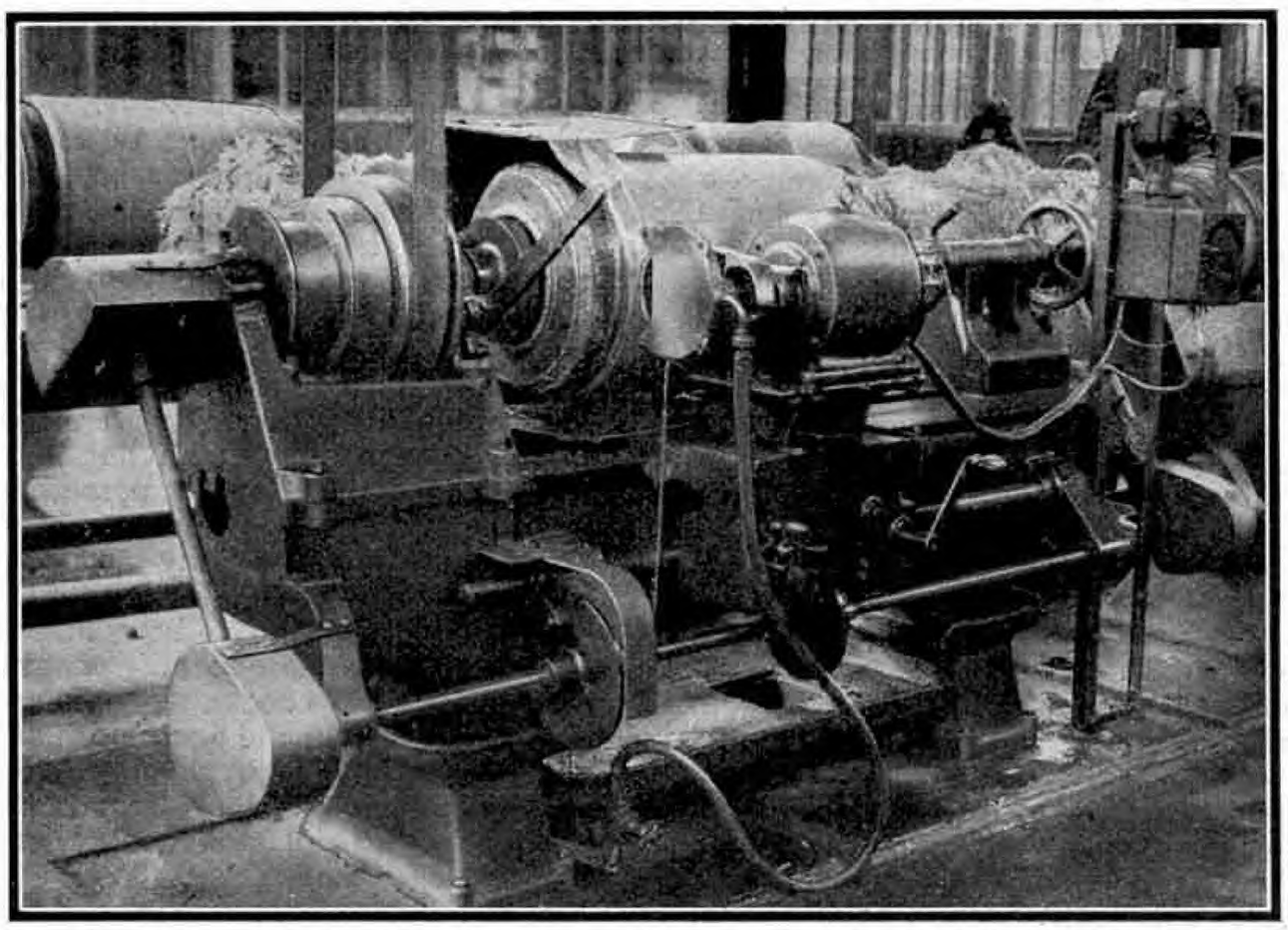
When James VI became King of England he continued his interest in golf, and this fact was largely responsible for the introduction of the game into England. In the early years of his reign it was played at Blackheath, which was the first English centre of the game.

The early Scottish game was similar to that now played, but the clubs and balls were very crude. The clubs employed in Stuart times were roughly-shaped pieces of wood, while the balls were merely leather skins so tightly packed with feathers that they were extremely hard. These balls were erratic in flight, and were incapable of rebounding well or of travelling easily along the ground.

The first improvement in golf balls came during last century, when the use of gutta percha was introduced by an unknown inventor. Gutta percha resembles rubber in being formed by the coagulation of a juice derived from a tree, its chief source being South America, from which it is exported in large quantities. Unlike rubber, gutta percha is hard when cold, but becomes plastic when warmed and then readily takes the shape of a mould. The earliest balls made from it were smooth-faced, but it was discovered that they flew better when they had been marked by being "topped" once or twice with an iron club. This led to the practice of cutting grooves on their surface, and subsequently regular markings were made by means of the moulds in which the balls were pressed.

The gutta percha ball, familiarly known as the "gutty," remained in favour from about 1848 until the beginning of the present century, when the rubber-cored ball was introduced. A well-made ball with a centre of this material has a long, straight carry when truly hit, runs well on the ground, and can be relied upon to maintain a true line when putting, a very important part of the game. The use of rubber therefore was a great step forward, and together with improvements in the design of clubs and the layout of courses, led to a remarkable increase in the popularity of the game.

Since the introduction of the first rubber-cored balls much ingenuity has been expended on the problem of ensuring their good flying qualities, uniformity and durability. The Dunlop Rubber Company are pre-eminent in work of this kind, and many remarkable machines may be seen at Fort Dunlop, the factory in Birmingham in which the balls produced by the Company are made. These are carefully tested at every stage of their manufacture, and it may safely be said that only in very rare instances can failure to fly well through the air, or to run accurately on the ground, be charged to the manufacturer.



One of the lathes on which sheets of prepared rubber are cut into the "tape" and "thread" used for winding round the cores of golf balls. The circular knife revolves at a speed of 300 r.p.m.

The first stage in the making of a golf ball is the preparation of the rubber. Raw material arriving at Fort Dunlop is cut up and passed through rollers that stretch and tear it, water being played on it in order to wash out the dirt. It is then dried in cellars supplied with warm air.

Pure rubber itself is too soft for use in the manufacture of golf balls, and before proceeding further it must be treated with various

chemicals. The most important of these is sulphur, which combines with it under the influence of heat and causes vulcanisation, a process that makes the rubber very tough and elastic. The vulcanised rubber is rolled into thin sheets from 70 yds. to 80 yds. in length. Each sheet is wound on a drum that is placed on a large lathe from 8 ft. to 10 ft. in length, and as it is rotated on this, a circular knife running along the machine cuts it into strips of the required width. Some of these strips are known as "tape" and others as "thread," and both are prepared for wrapping round the centres of the balls at later stages of the process of manufacture. The long strands are stripped from the machine by hand, and after being disentangled on combing drums they are wound on bobbins.

The centres round which the tape and thread are wrapped consist of small rubber bags containing a heavy paste, the nature of which is kept secret. Each bag is weighed in order to make sure that it contains the correct amount of paste, and its neck is tied with elastic thread. Other tests are then applied, and if the centre is satisfactory, winding begins. Tape is wrapped round first. This operation is commenced by hand, trained workers wrapping a strip about 12 in. in length evenly and accurately round the core; and is completed by means of machines in which the centres are revolved rapidly and eccentrically in order that the tape may be distributed evenly. During winding the thin rubber strip added is stretched to four times its original length, and great care is necessary at this stage, for the resiliency of the finished golf ball largely depends upon the accuracy with which the tape is put on.

The centre is built up in this manner until it reaches a certain size, and the rubber thread is then wound over it. This is fed to the ball through a device that stretches it, and during the winding the core is rotated and twisted between steel rollers in order to ensure that the finished product is perfectly round. This completes the making of the inner portion of the ball, which now only lacks a cover; but before this is added the ball is again tested for size, compression and weight.

The cover of a golf ball is fitted in stages, the material of which it is made being applied to each half separately. Each centre is slightly smeared with gutta percha, and is passed to an operator who holds it in a stream of this substance issuing from an opening in an automatic machine that supplies the exact quantity required to make half the cover. The ball is then pressed into a metal mould that roughly shapes the portion of the covering material added. The mould is one of a large number on a revolving table that is thoroughly cooled by means of refrigerating machinery, and in it the gutta percha covering quickly solidifies.

The second half of the cover of each centre is added in a similar manner, and the roughly-formed balls are then placed in a covered rack that carries them slowly forward into a drying chamber. There they are lost to view for 36 hours, for the machinery is so arranged that it is impossible to remove them until they have spent this period of time inside the chamber, the thorough drying-out of each ball thus being ensured.

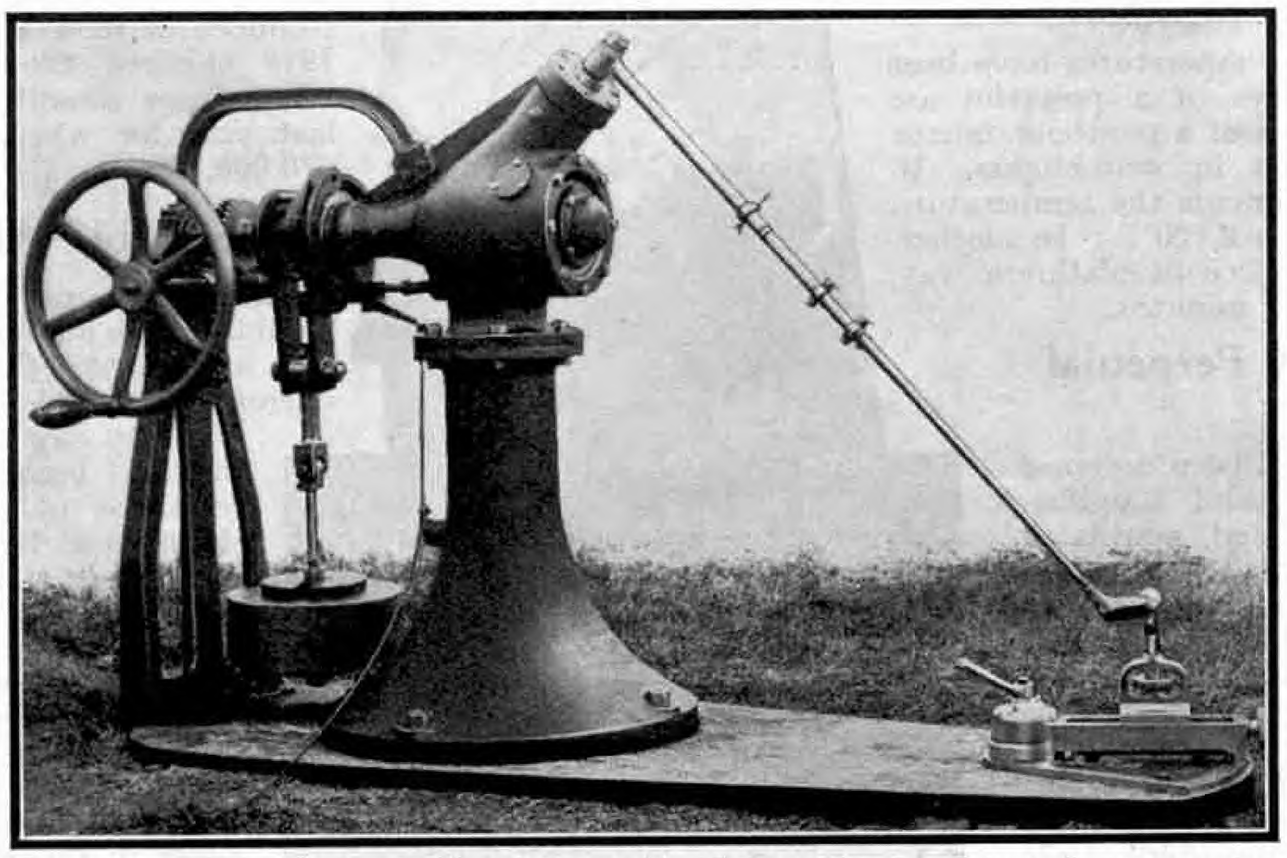
Except for the paint, the whole of the material required for each golf ball has now been assembled, and the products are ready for the moulding and pressing that gives them their form. They are not allowed to go on to the finished stage until they have been weighed, however, and for this test they pass over an automatic machine that detects variations in weight of as little as one thousandth of an ounce. A conveyor then carries the balls to the moulding machine, where they are placed in moulds, formed in two sections, that have the Dunlop pattern marked on them. They are stacked in a column, and pressure is applied by means of a hydraulic ram in order to enable the screw clamps of the moulds to be tightened. Each column is then picked up by a travelling overhead crane and lowered into hot water, the gutta percha coverings of the balls being made plastic by the rise in temperature. After a short time in the hot bath the column of moulds is lowered into cold water, where it remains until the balls are cold.



Covering golf balls with gutta percha. This is done in two stages, the machine illustrated delivering sufficient material to form half the covering. The gutta percha is roughly shaped in the moulds on the revolving table, which are cooled by means of a refrigerating mixture and thoroughly dried on the covered rack shown on the right.

The balls require painting when they emerge from the moulds in which they are pressed. Many experiments have been made in order to discover the best means of applying the paint, and it is interesting to find that the most satisfactory results are obtained by simply rolling each ball between the palms of the hands, in which a small amount of paint has previously been placed. When the paint is dry the special marks are picked out in colour. This is not difficult, for the markings already have been impressed on the cover during the moulding, and it is only necessary to fill these evenly and thinly with coloured paint.

Painting is the last operation in the manufacture of a golf ball, and when this has been completed all that remains before packing is a final test. Each ball in turn is placed on the scale of a very delicate balance in order to make sure that it weighs exactly 1.62 oz. Then it enters a machine in which it is automatically wrapped and the package sealed. As each ball is dealt with, the machine cuts off a piece of paper of the right size, makes four folds in it, and tucks in the ends round the ball to complete the wrapping. Finally it damps the adhesive side of a seal and places it in the correct position on the wrapper. It is then a simple matter to pick up the little package as it leaves the machine and to place it along with others in boxes ready to be sent to dealers for sale to golfing enthusiasts.



The most powerful and accurate driver in the world. This machine is used for testing the carrying powers of Dunlop Golf Balls in actual flight.

A special feature of the manufacture of golf balls at Fort Dunlop is the number of times that these undergo tests. They are carefully measured and weighed at almost every stage in order to ensure that the finished balls shall be uniform, and in addition a selected number from each consignment actually are driven by means of an automatic machine in which they are struck with unerring accuracy and constant strength. This is a splendid test of carrying power, for each ball leaves the machine at

(*Continued on page 462*)



Of General Interest

Airport Beacon to Act as a Clock

Novel means are being taken to enable the inhabitants of Guayaquil to tell the time at night. Guayaquil is the capital of Ecuador, the South American republic, and a Moorish clock tower is being erected in gardens on the sea front. A large airport beacon is to be mounted on top of the tower. This will make a complete revolution in twelve hours, and time will be indicated by the direction of the beam. The use of the clock will be made easier by the fact that at certain hours prominent landmarks in the city and its surroundings will be illuminated. Thus at night the city itself is to be the dial of this remarkable clock.

The beacon is fitted with a 1,000-watt lamp supplied by the General Electric Company of New York. It is to be controlled by an electric clock from which current impulses will be transmitted every five seconds to energise mechanism causing the beacon to rotate through a small angle.

Metals Melted by Means of Burning Mirror

There have been many stories of the use of large curved mirrors capable of concentrating the heat of the Sun and of directing it against hostile ships. Archimedes, the famous Greek scientist who lived in Syracuse, Sicily, in the 3rd century before Christ, is said to have invented an enormous burning glass of this kind for the purpose of setting fire to the ships of the Roman besiegers of the city. A large burning mirror constructed in more recent times in Sweden for a similar purpose is still to be seen in the Artillery Museum of Stockholm, but it is scarcely likely that either Archimedes' mirror or that at Stockholm was very effective!

On a small scale very high temperatures have been obtained by focussing the rays of a powerful arc lamp on a small area by means of a parabolic mirror similar to the reflectors used in searchlights. It is claimed that in these experiments the temperature at the focus of the rays was above 2,100°C. In another trial it is said that a small piece of platinum was melted in the short time of four minutes.

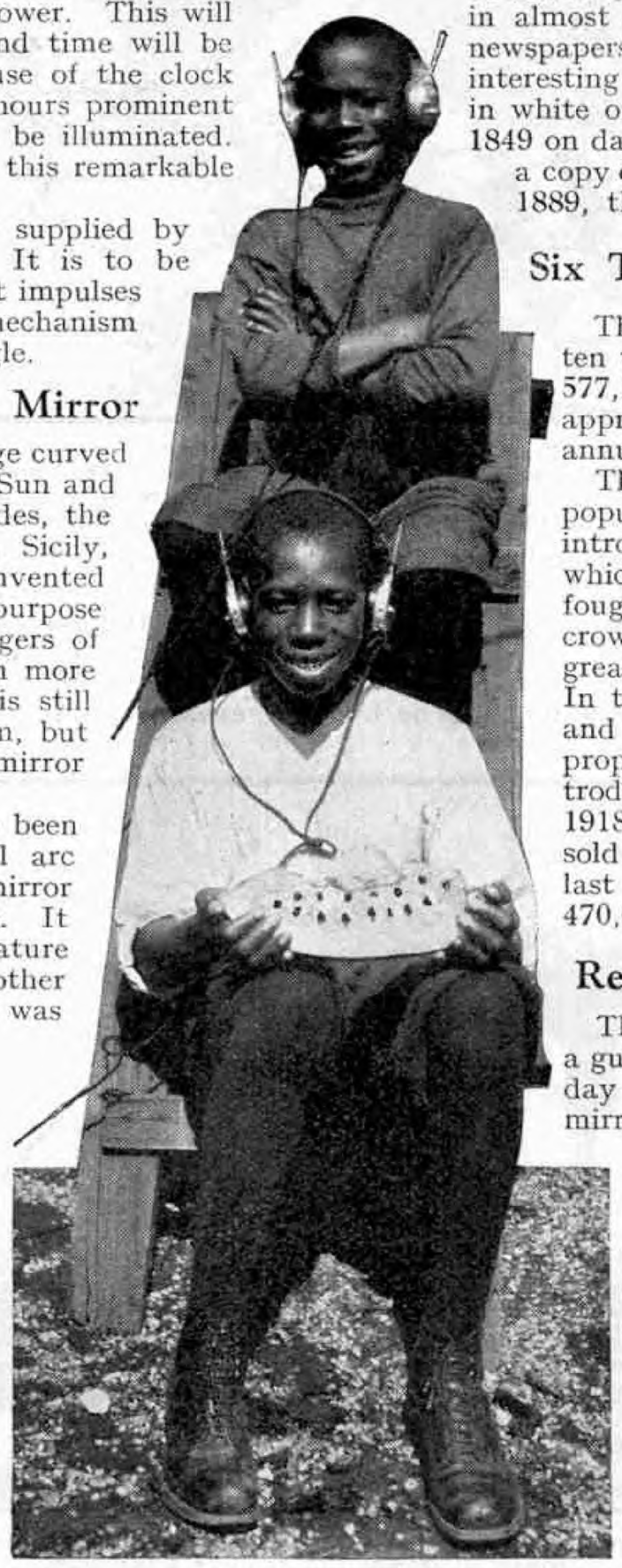
Windowless House of Perpetual Spring

A house without windows has been designed by the Westinghouse Electric and Manufacturing Company. This is heated, ventilated and lighted entirely by electrical means and the effect is to create in it what may be described as a perpetual spring-like atmosphere.

The method of heating adopted in this remarkable house is very ingenious. It is the loss of bodily heat that makes us feel cold and it has been found that about half of this is due to radiation. Small heaters have been fixed behind panels on the inner walls of the house in order to provide counter radiation, therefore; and these also supply the additional heat required to compensate the occupants for loss of heat due to evaporation of moisture from the skin and to convection, or the transference of heat by means of air currents. Both these effects are diminished by careful ventilation and regulation of the proportion of moisture in the air and by controlling the air currents. Lighting is supplied by electric lamps that radiate ultra-violet rays. In ordinary houses these rays are not usually present, those reaching the Earth from the Sun being cut off by clouds or unsuitable glass.

A Newspaper Museum

One of the most remarkable museums in the world contains the largest collection of newspapers that is open to the general public. It is at Aix-la-Chapelle, and the 15,000 newspapers exhibited include curiosities from all countries, and in almost all languages, ranging from old manuscript newspapers to a journal published for Eskimos. Other interesting exhibits are a spiritualist newspaper printed in white on black paper and a socialist newspaper of 1849 on dark red paper, while the collection also includes a copy of the Cologne "*Volkszeitung*" of 31st October, 1889, that is printed in gold letters.



The pleasures of wireless! The use of earphones leaves the enthusiast free to enjoy his melon.

Six Thousand Million Letters a Year

The British Post Office now handles more than ten times as many letters as it did in 1859, when 577,121,000 were delivered in this country. The approximate number of letters now dealt with annually is more than 6,000,000,000.

The postcard still lags behind the letter in popularity, but has made great strides since its introduction sixty years ago. On the first day on which postcards were issued, eager curio hunters fought furiously to secure specimens and the crowd of buyers in St. Martin's le Grand was so great that police regulation became necessary. In the first year 75,000,000 postcards were used, and the traffic in postcards increased to enormous proportions when the picture postcard was introduced in 1894. Raising the postage to 1d. in 1918 checked the expansion, but the number sold is now steadily increasing and in 1928, the last year for which figures are obtainable, was 470,000,000.

Remarkable Air Beacon at Chicago

The Pharos, or lighthouse, of Alexandria was a guide to the mariners of 2,000 years ago both by day and night. On it there was an enormous mirror of polished metal that reflected the Sun's rays by day and was illuminated by torchlight at night, when it was visible from a distance of several miles. A modern lighthouse built on similar principles has been erected at Chicago in order to act as a guide to airmen. Neon lamps are employed as the source of illumination, and their reddish-orange glow is concentrated into beams by means of eight parabolic mirrors, each of which is five ft. in height. These beams are visible at much greater distances than the glow of the neon tubes used in other beacons.

As is the case with ordinary lighthouses, the Chicago air beacon flashes in accordance with an arranged code that enables it to be easily recognised. Eight 24-in. searchlights are placed at the foot of the beacon, and two opposite beams of white light from these are successively extinguished at regular intervals in a counter-clockwise direction. This gives the same effect as rotating the beams, and airmen will have no doubt of their approach to Chicago when they see a beacon with eight stationary orange beams under which appear six apparently rotating shafts of white light.

Plants Grown in Electrically-Heated Soil

A Japanese market gardener in California recently tried the experiment of growing cucumbers in electrically-heated soil. He buried 700 ft. of insulated copper wire under a small plot, and connected it to the 110 v. electric mains, installing also a device that automatically switched on current when the temperature fell below 70°F. Current actually flowed for an average length of time of a little less than ten hours daily, and the effect of the continual warmth was seen in the early ripening of the plants. Other plants treated in a similar manner, but grown in unheated soil, ripened much later, and yielded fewer and smaller cucumbers. The higher price realised for the early cucumbers more than compensated for the cost of heating the soil.

An Ancient Craft

An ounce of gold may be beaten out to cover an area of no less than 175 sq. ft., and the sheets of gold leaf produced would be so thin that a pile 1 in. in height would contain no fewer than 167,000 of them.

The art of beating gold leaf is one that has remained practically unchanged for thousands of years, for no better method of making it has been discovered than the ancient one of hammering thin sheets of the metal placed between layers of goldbeater's skin. The skin is prepared from portions of the intestines of cattle and sheep by careful washing and drying, and is the only thin material known that is sufficiently tough to withstand the repeated blows of the goldbeater's hammer.

Testing Welds Without Destroying Them

An interesting method of testing the soundness of welds in metal has been developed in the Research Laboratory of the Westinghouse Electric Company. This completely avoids the necessity for cutting the metal, while ensuring that the joint is sufficiently strong for use.

For testing purposes the welded seam is placed between the poles of a large horseshoe electro-magnet. The presence of flaws or cavities disturbs the regularity of the magnetic lines of force across the weld, and this is revealed by measurements of the intensity of the magnetic field at various points near the joint. A meter has been devised for the purpose, and tests are quickly made by merely passing this over the weld. Even deep-seated faults may be detected by this method, which may be used in examining large butt welds in structures such as generators and flywheel rims.

Broadcasting Speech Round the World

An interesting experiment recently carried out by the General Electric Company of New York was the transmission round the world of a talk given in Schenectady. The voice of the speaker was broadcast from station W2XAD, and was successively relayed by short wave stations at Huizen in Holland, Bandoeng in Java, and Sydney. From Sydney it was returned to Schenectady. There it was received in the very room from which it was being sent out, the speaker's voice being accompanied by an echo that repeated every syllable an eighth of a second later. It is claimed that this was the first round-the-world broadcast, and the total distance covered by the transmissions was about 22,900 miles.



An anti-aircraft gun brought into action by the crew of a British tank engaged in manœuvres.

Rescuing the Swallows

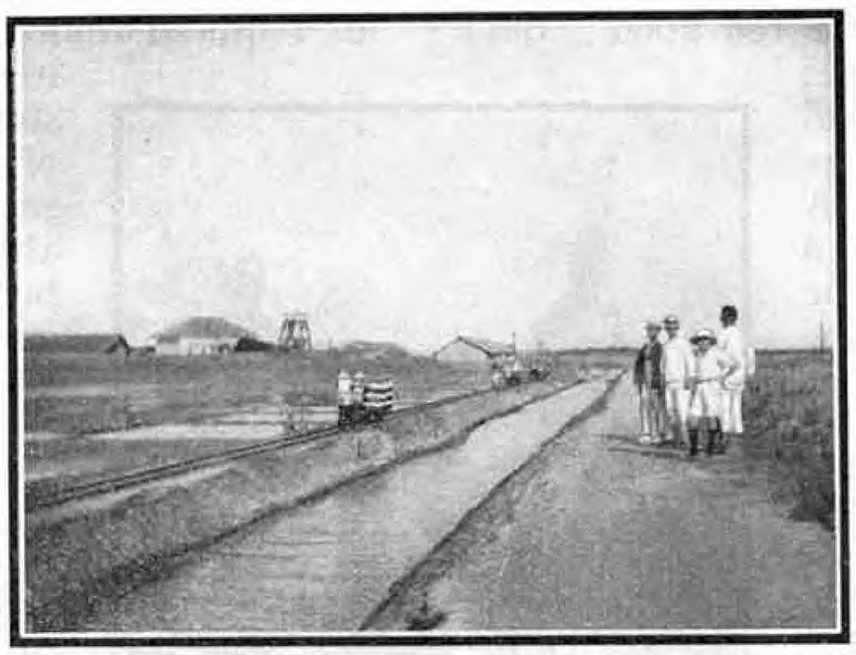
Last autumn wintry conditions set in before the swallows of Central Europe had completed their preparations for the annual migration to warmer climates in the South. When a sudden snap of cold weather caused the insects on which they depend for food to disappear, the swallows hastily tried to cross the Styrian Alps, but the effort ended in disaster, for already snowstorms and blizzards were raging. Thousands of birds were unable to cross the mountains, and the belated travellers appeared to be doomed.

At this crisis the Viennese Society for the Protection of Birds came to the rescue. As many swallows as possible were captured—an easy task, for they were cold and exhausted—and after being fed and kept in warm rooms for a short time in order to enable them to recover their strength, they were loaded into cases for transport by aeroplane to Venice. There they were again fed and released to continue their flight southward. Other birds afterwards were transported by means of special trains, and altogether more than 40,000 swallows were helped on their way to their winter homes.

New Uses for Rare Metal

A metal that is growing in industrial importance is beryllium. It is lighter than magnesium or aluminium and is sufficiently hard to scratch glass. A few years ago the metal was so rare that its price was about £40 per lb. Recent discoveries of extensive deposits of beryllium ore in Idaho, U.S.A., and the Styrian Alps, Austria, and the introduction of new methods of extraction, have reduced the price of the metal considerably.

Practical uses may now be found for beryllium. It is already employed in making X-ray apparatus and in the manufacture of the electrodes of the neon tubes whose pink glow is such a prominent feature of modern illuminated advertising signs. A very hard glass and a special porcelain for use in sparking plugs also are made from its oxide, and as the metal becomes more common it probably will find increasing employment in the production of light-weight alloys for use in aircraft construction.



Salt manufacture in Formosa. The heat of the Sun is used in the evaporation of the brine from which the salt crystallises. Our photograph was taken by W. E. Broadbridge, a reader of the "M.M." living in Formosa.

Floodlight Projector for Use Under Water

A submersible floodlight projector that has been introduced by the General Electric Company of New York is intended for use in swimming baths or pools and to illuminate fountain sprays at night. It does not form an obstruction under the water, for it is only $10\frac{5}{8}$ in. in diameter and 9 in. in depth.

The casing of the projector is of cast aluminium, which is not corroded when submerged, and a flexible ball and socket pipe fitting is attached to it in order that it may be adjusted to any required position. It gives a fan-shaped beam of light, and this is directed in such a manner that it does not leave the water, the rays of light that reach the surface meeting it at such an angle that they are reflected downward again. In this manner glare for spectators and swimmers is avoided and ample light is given for under-water movements.

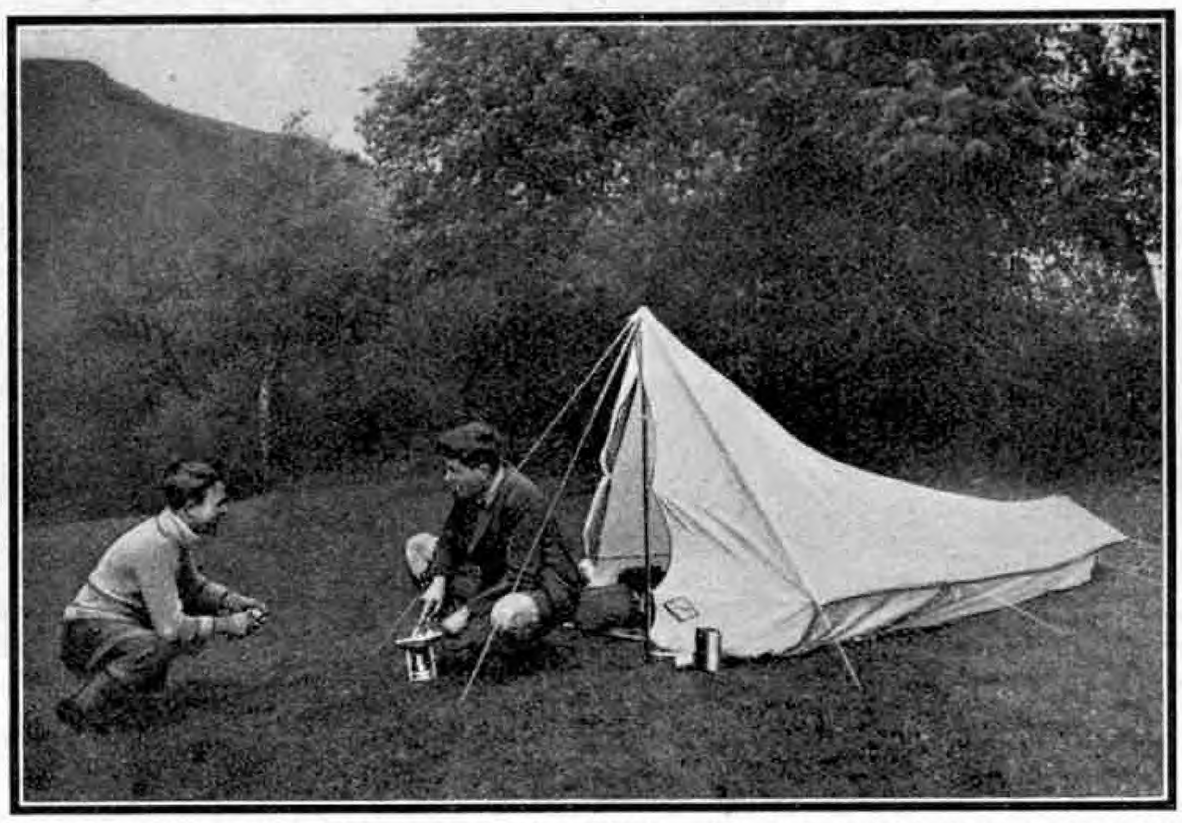
A 250-watt lamp is employed when the projector is submerged, but when it is used to illuminate fountains, one of lower wattage may be used. For this purpose the unit may be installed directly beneath the sprinkler and splendid effects may be obtained by the use of coloured lenses.

How to Plan a Camping Holiday

The Little Things That Matter

THE pleasures of an open-air life cannot be appreciated to their full extent until a holiday has been spent under canvas. Camping has a thrill of its own, and those who have slept with only a roof of canvas between themselves and the stars know the delights of waking at dawn to find the sun streaming in through the tent flap, and the songs of the birds encouraging one to get up and enjoy life.

There appears to be a widespread impression that a camping holiday is one beset with discomforts and difficulties that can be overcome only by the hardiest, but this is by no means correct. On the contrary, such a holiday, if well planned, is peaceful enjoyment. Of course the camper must be prepared to see the humorous side when things do not go quite as they should. Even if a friendly but too inquisitive cow upsets the day's milk supply and treads on the eggs, it is foolish to lose one's temper!



Campers enjoy a joke while preparing breakfast. The type of tent shown is ideal for two on account of its simplicity and lightness.

Careful planning beforehand is absolutely necessary if a camping holiday is to be a success. If suitable arrangements are made beforehand, the holiday will be enjoyable even if the weather is not too good; but without preliminary planning, troubles of all kinds are likely to occur that will cause irritation and annoyance, and go far towards spoiling the outing. A camping holiday costs very little, and apart from the initial outlay for the equipment the expenditure is only a few shillings per head per day, the exact amount depending mainly on the tastes of the individual. If they have simple tastes—and after all campers must be prepared to forgo some of the luxuries of home life—a party of two or three boys can camp in comfort for about 3/- each per day. For a larger party the cost may be even less.

The chief preliminary expense is concerned with the equipment, but if this is looked after properly it will last for years. Tents may now be obtained for less than 20/-, but those who are taking up camping for the first time are strongly advised not to economise on the tent more than is absolutely necessary, and in particular to pay the extra price for a tent of rot-proof material. A tent of poor quality is not only very unsatisfactory if the weather happens to turn wet, but also it will deteriorate rapidly and soon have to be replaced. If three or four boys decide to camp together, they can obtain first-class equipment by clubbing their funds. Each boy then enjoys the full use of the whole, but has to pay a comparatively small amount.

Another important item of equipment is the ground sheet, and here again a cheap article is false economy. A thin sheet of poor quality is very easily torn, and is in every way thoroughly unsatisfactory.

Other equipment includes the necessary cooking utensils, the number and size of which depend upon the size of the party. Several types of canteen are available, consisting of different sized pans that fit one inside the other for convenience in carrying. Each camper should have an enamel plate and cup, and knife, fork and spoon. Crockery and glass should be avoided, as they are easily broken. It is possible to obtain special knives and forks that fit together, the handle of the fork covering the knife blade and the fork being protected by the knife handle. These are quite cheap and very convenient. Suitable containers for foodstuffs are required, and tins are best for the purpose. If such items as tea and sugar are not properly stored they have an unpleasant habit of becoming mixed with other items such as the butter, with very undesirable results. Special containers for butter are available, consisting of an outer case of aluminium with a glass lining, and these are very useful in the hot days of summer when the butter is liable to become oily. A great saving of weight will be effected if aluminium is used for all the utensils, but this means a considerable increase in cost. An item that is of great importance and is easily forgotten is a tin opener.



Scouts show how simple a camping outfit can be.

A Primus stove is an item that should be purchased if possible. It is specially useful for campers who do not wish to have the trouble of lighting fires, and it is a decided boon on a wet day. A small collapsible stove that fits into a tin of handy size is ideal for the purpose, and will be found to meet all the requirements of a party of three or four. A supply of paraffin and methylated spirits should be carried, for although farmers generally have these commodities and are willing to oblige if a courteous

request is made, this should not be relied on entirely.

When making preparations it is a good plan to prepare a list of all the articles that are likely to be required, and then to go through this list carefully, crossing out every item that can possibly be dispensed with. Before starting on the holiday the equipment should be checked off with this final list to make sure that nothing has been forgotten. The absence of even a small item is apt to be irritating when one is miles from the nearest shop. The amount of personal gear depends of course upon the length of the holiday, but in any case it should include a change of socks and, if possible, a pair of light shoes or "pumps," toothbrush and paste, sponge, soap, towel, hairbrush and comb and mirror, needle and cotton, string, pocket knife, and electric torch. A small first-aid outfit should always be included, for even the most trivial cuts, scratches or insect bites may give rise to trouble if they are neglected.



A happy group of members of the Weston Meccano Club at their Whitsun (1926) Camp in the Mendip Hills.

Each camper needs two blankets or, as an alternative, a sleeping bag. The bag need only be a home-made article, and may consist simply of two blankets stitched together to form a bag of double thickness, left open at the top and a little way down the side. Tapes attached to the opening make it possible to fasten up the top after one is inside. The bag will be found warmer than loose blankets, and for extra warmth and protection against damp it may be covered with waterproof material which, however, should be easily detachable so that the blankets may be aired each morning.

The actual site for the holiday camp should be determined carefully beforehand, and a very useful book for this purpose is "Camping Holidays," obtainable from the Great Western Railway. This book is divided into counties, and camping facilities in numerous towns and villages are given with useful information such as the contour of the ground, the distance from the nearest railway station, the nearest water supply, etc. Special railway facilities are available for parties of campers, and details may be obtained at any railway station.

Those who intend to tour, choosing their own camping site at the end of the day's journey, should begin to look out for a likely place at least an hour before sunset in order to allow ample time to pitch the tent and prepare a meal. The position chosen should be sheltered as far as possible from the prevailing wind, and a site on the lee side of a hill or wood is ideal. The question of water supply should not be overlooked. There is no difficulty in this matter if a clear stream is within convenient distance, but in the absence of this, water must be obtained from a local farm. It should not be overlooked that campers are not justified in dumping themselves down in any place that takes their fancy without obtaining permission from the owner or occupier of the land. In most cases a visit to the nearest farm will secure the necessary permission without difficulty. If it is intended to light a fire permission to do this should always be asked, and as a rule it will readily be granted unless the position chosen for the camp is considered dangerous. If the tent is of the type that is narrower at one end than the other, the narrow end should face the wind; otherwise the opening of the tent may face south or south-east. The ground should be cleared of sticks and twigs before the ground sheets are laid down, and for obvious reasons it should be made a rule to remove boots before entering.



Fun during washing up operations.

The next step is to prepare the meal, and after a day's outing this will be considered the most important one! Potatoes, eggs and milk can generally be had from the farm, and butter and bread may often be obtained, but it is not advisable to rely on obtaining all that is needed. If the camp is to remain in the same place for a few days, the question of food supplies must be settled at the beginning, and the farmer will be able to suggest the best source of supplies. A quick meal can be prepared from fried chops, or steak and potatoes. For variation, a stew can be made by cutting up the meat and placing it in the billycan with a little water, chopped onions and carrots and seasoning, potatoes being added later if a thick stew is favoured. Tinned food is handy, and generally has to be used to some extent, although of course fresh foodstuffs are to be preferred. Prepared foods, such as "Force," etc., are convenient and appetising for breakfast or supper. Intending campers are recommended to spend a little of their spare time in the kitchen at home beforehand, as even a small amount of knowledge obtained in this way will be found most useful.

(*Continued on page 462*)



British Attempt on World Record Flight

The Hon. Mrs. Victor Bruce this summer is to endeavour to break the world's record for a refuelled flight. She will be accompanied by Mr. Bruce, and it is hoped that during the flight the machine will appear over various towns and airports, where it will form an added attraction at air displays. It is interesting to note that when necessary, Mrs. Bruce will be given her position by the direction-finding stations at Croydon and Lympne in the manner described in the article on page 434 of this issue.

The attempt has been very carefully organised in order to avoid as far as possible the risks of a flight of this kind. For instance, a six-wheeled lorry, equipped with wireless apparatus, will carry meteorological and navigation experts about the country, and from it weather reports will be despatched to the pilots of the machine by wireless to enable them to choose the best course to follow in order to avoid stormy conditions. During the flight the machine will be accompanied by a Comper "Swift." This will act as a convoy and also will test weather conditions.

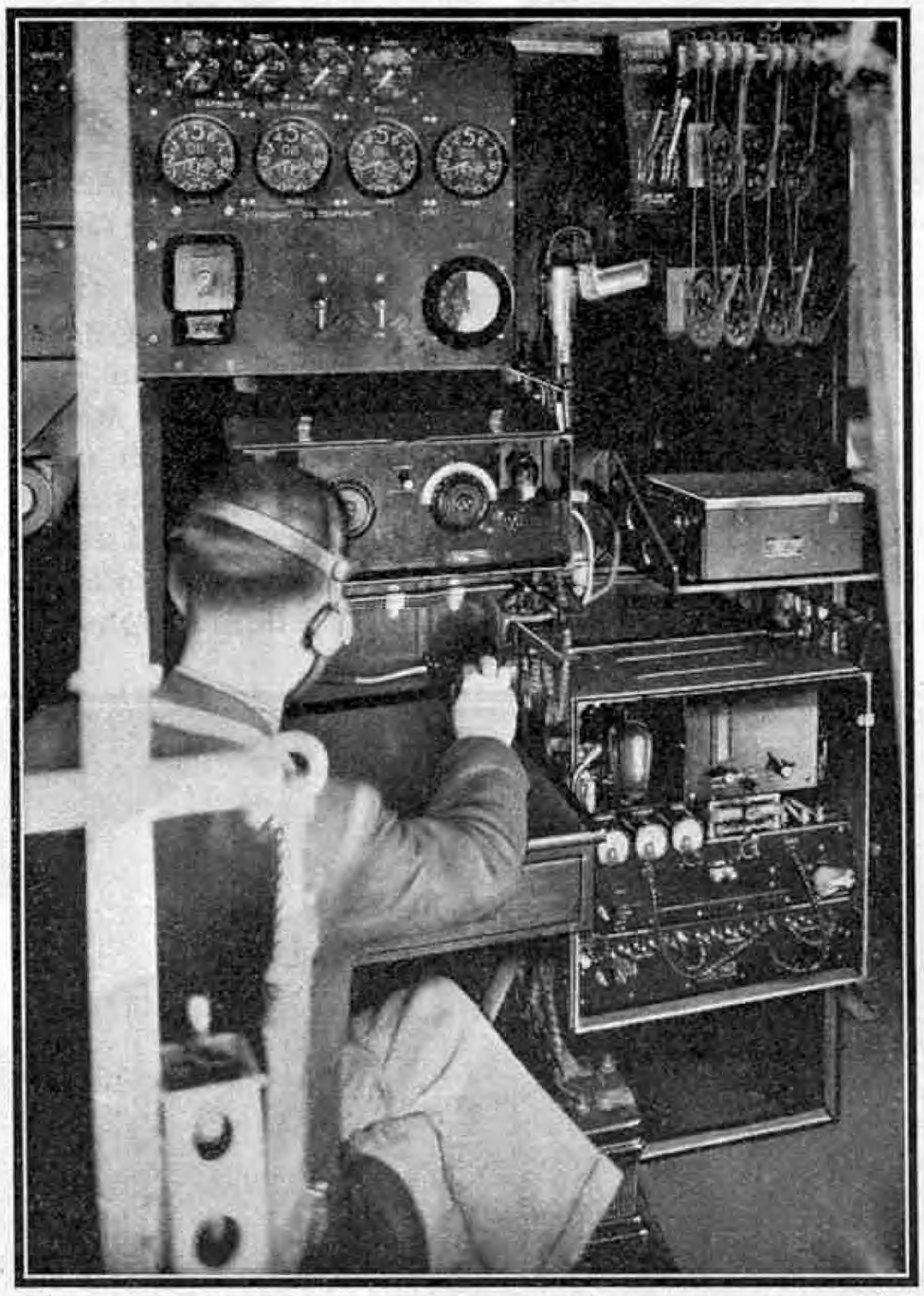
The interior of the machine in which the flight is to be carried out has been specially fitted to give every possible comfort, and it will be possible for the pilots to go to bed, to cook all their meals and even to have a bath!

Wind Indicator for Night Flying

Every aerodrome is fitted with at least one "wind stocking," or open-ended canvas sleeve mounted on the upper end of a mast in order to indicate to pilots the direction in which the wind is blowing. For night flying the wind stocking is practically useless and an interesting substitute has been produced by Chance Brothers Ltd., of Birmingham. The new indicator consists of two beams placed in the form of a "T" and mounted on a small girder. On top of the beams are a number of neon tubes that when lit up at night may readily be seen by approaching pilots. The "T" beams are mounted in such a manner that they may easily be swung round by the wind and the mechanism is so sensitive that it is affected by wind speeds as low as four m.p.h. The indicator does not oscillate violently when caught by sudden cross gusts of wind, however, a special braking device being fitted. A small indicator of this type also has been developed.

American Aeroplane Demonstrations

It is reported that aircraft constructors in the United States have become greatly alarmed at the increasing amount of export trade that is being done by British aircraft constructors, and therefore they intend this summer to send to this country a fleet of the fastest American aircraft constructed in order to draw the attention of possible foreign purchasers to their products. These machines will be flown by American pilots, who will endeavour to break all British records and all the European records that are held by British machines. It is interesting to recall that last year Captain Frank Hawks, the famous American pilot, visited this country and set up many records in an American low-wing monoplane.



The wireless cabin in a Short "Kent" flying boat, showing the powerful Marconi wireless transmitting and receiving apparatus that can be operated when the flying boat is in the air or on the water. Photograph by courtesy of Marconi's Wireless Telegraph Co. Ltd.

Record Flight to Capetown

Mr. J. A. Mollison, who in July last year made a record flight from Australia to England, has now set up a new record for the journey between England and Capetown. Mr. Mollison made this flight in a D.H. "Puss Moth" in 4 days 17½ hours. The record was only set up by dint of almost continual flying and when Mr. Mollison reached Capetown he was so tired that the lights on the aerodrome dazzled him. He therefore landed on the beach, running his aeroplane into the water. Mr. Mollison's flight was made in 15 hours less time than the previous record, which was set up by Mr. Gordon Store and Miss Peggy Salaman.

A world's record for distance over a closed circuit has been made by the celebrated French airmen MM. Bossoutrot and Rossi, who flew a Blériot-Zaffata 110 monoplane named "*Joseph Le Brix*," fitted with a 500 h.p. Hispano Suiza engine, for 76 hours 35 minutes. During this time the airmen covered a distance of about 6,575 miles, exceeding by about 145 miles the distance flown by MM. Doret and Le Brix, the previous holders.

Conducted Air Tours Abroad

This summer it will be possible for the first time for holidaymakers to make conducted tours by air. The tours are being organised by Imperial Airways Ltd., and the first flights arranged are to Egypt. During these tours, which will occupy three weeks, passengers will alight at Paris, Brindisi, Athens, Galilee and Cairo; and at many of the places visited, long stops are to be made in order to enable land excursions by motor car to be undertaken. The fare, including hotel expenses and the cost of meals and railway connections, is about £80 per person. This does not include the cost of any land excursions that may be undertaken.

Bristol "Jupiters" in Russian Aeroplanes

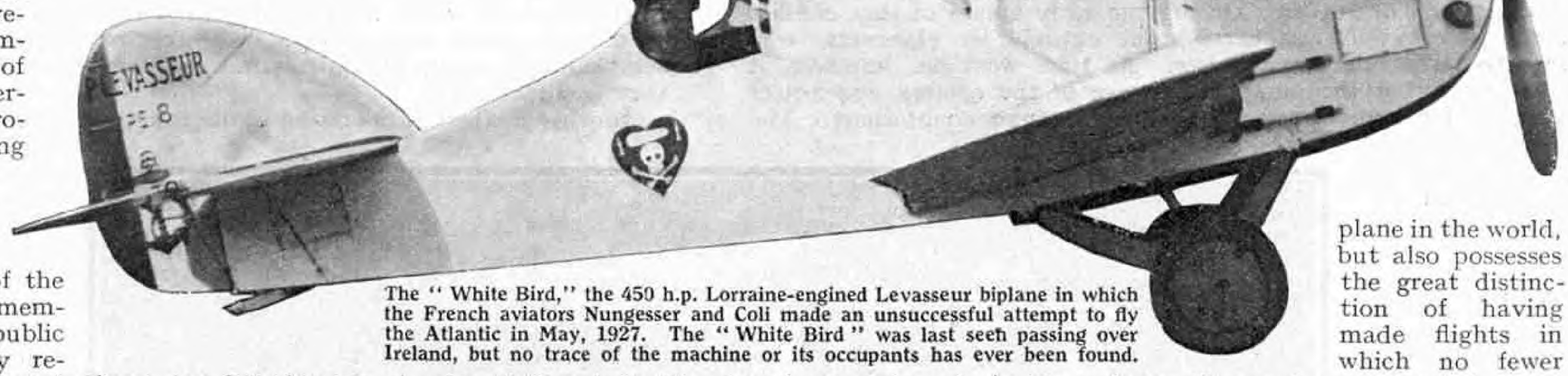
An interesting civilian aeroplane has been produced by a Russian aeronautical factory. The machine is known as the A.N.T.14 and is a five-engined all-metal cantilever monoplane. The engines employed are Bristol "Jupiters."

The new aeroplane has accommodation for 34 passengers and should be capable of attaining a maximum speed of 133 m.p.h. and of cruising at 110 m.p.h.

Interference with Aircraft Wreckage

The Air Ministry desire to call the attention of the general public to the great difficulties that have sometimes been caused by private persons thoughtlessly removing parts of damaged aircraft.

It is of the greatest importance that the causes of accidents to aircraft should be ascertained. Whenever a serious accident is reported, the Air Ministry Inspector of Accidents proceeds with the least possible delay to the scene of the accident to examine the crashed machine, and it is essential for his purposes that the wreckage should not have been disturbed more than is necessary to set the occupants free and to prevent any immediate risk of damage to persons or property. During the interval, therefore, before the arrival of the inspector, members of the public are earnestly requested to abstain from any interference with a wrecked aircraft, except for these emergency purposes. The police already have instructions on the whole matter, and interference with wreckage is definitely prohibited by law.



The "White Bird," the 450 h.p. Lorraine-engined Levasseur biplane in which the French aviators Nungesser and Coli made an unsuccessful attempt to fly the Atlantic in May, 1927. The "White Bird" was last seen passing over Ireland, but no trace of the machine or its occupants has ever been found.

A further point of great importance is that broken pieces of the aircraft (for example, a part of a propeller) may be found some distance away. It will be of the utmost assistance if the finding of such pieces is immediately reported to the police, or to the Inspector of Accidents.

Although breaches of the law have occurred, the Air Ministry feel sure that no one would wish to retain a broken part of an aircraft in these circumstances for whatever purpose, even though it is an apparently insignificant item, once it has been pointed out that it may be essential to the authorities for tracing the cause of the accident. In a recent case a broadcast appeal for missing parts was made and three members of the public went to much trouble in reporting the finding of certain bits of metal. This enabled the Air Ministry to establish the cause of the accident in question beyond doubt.

England-Australia Record Again Broken

Mr. C. W. A. Scott has succeeded in setting up a new record for the flight from England to Australia, having completed the journey in 8 days, 18 hours, 22 min. in a D.H. "Gipsy Moth." The previous record, made by Mr. C. A. Butler in a Comper "Swift," exceeded Mr. Scott's time by 7 hours, 36 min.

New Imperial Airways Port of Call

Imperial Airways flying boats operating on the service between England and India now call at the port of Limasol, on the Island of Cyprus. The opening up of Cyprus to air travellers will enable travellers from this country to reach the beautiful island three days after leaving London. The new port of call should be popular also with many of those Europeans who are stationed in the desert countries of Iraq and Palestine, for they will be able to spend long week-ends in Cyprus. Passengers who leave Basra or Baghdad on Friday will reach the island before mid-day on Saturday and will be able to catch the return air service on Tuesday, alighting again at either Baghdad or Basra on Wednesday afternoon.

Catapults for Atlantic Air Service

It is proposed by Deutsche Luft Hansa to put into operation an air service between Germany and South America. The service will necessitate flying across the South Atlantic Ocean, and it is intended to install catapults on each side of the Atlantic route in order to shoot the machines into the air. The catapults will be of a type that may be used with both seaplanes and flying boats and their use will enable heavily-loaded aircraft to avoid the buffeting in the heavy swells and rough seas experienced off the South Atlantic coast.

If the service is put into regular operation the catapults will be erected near Bathurst, Gambia, on the African side, and near Pernambuco, Brazil, in America.

World's Largest Bomber

The lower illustration on this page shows the Caproni Ca.90P.B., an Italian machine that is not only the largest bombing aeroplane in the world, but also possesses the great distinction of having made flights in which no fewer than six world records were created.



The Caproni Ca.90P.B., the world's largest bomber. The employment of a short upper plane gives this machine an unusual appearance that is characteristic of certain of the products manufactured by the Società Italiana Caproni.

The machine is a six-engined sesquiplane and is of unusual appearance, the shorter of the two planes being the upper one, and not the lower as in most sesquiplanes. The engines of the machine are mounted similarly to those of the British Short "Singapore" Mark 11, being carried in tandem in streamlined nacelles. They are of the Isotta-Fraschini "Asso" water-cooled type and have 16 cylinders, the total power developed being 6,000 h.p.

The great aeroplane is well provided with cockpits, for in addition to that for the two pilots, there are three others, situated in the nose, immediately behind the wings, and in the top centre section of the upper wing respectively. The cockpit behind the wings also is the main gunners' cabin and is provided with machine gun positions above, below and in the sides. The machine's supply of bombs are carried in a special compartment below the wings, and this has accommodation for about 17,600 lb. of bombs.

The span of the short upper plane is 114 ft. 5½ in. and that of the lower one 152 ft. 9 in. The machine is 88 ft. 4 in. in length and measures 35 ft. 5 in. in height. It has an empty weight of about 33,000 lb., the loaded weight being exactly twice this amount and in spite of its immense size and the huge loads that it is capable of carrying, the machine has a maximum speed of more than 127 m.p.h. and a stalling speed of only 56 m.p.h. It has a ceiling of 14,760 ft. and its fuel tanks carry sufficient petrol to enable it to cruise for seven hours.

Photography from Aeroplanes

United States Army Air Corps Activities

ONE of the most interesting branches of work performed by the United States Army Air Corps, not only with regard to its military value, but also its employment in connection with civilian agencies, is that involving the use of aerial photography. In the military field it obtained its first great impetus during the World War. During the early stages of that conflict aerial observation was carried out entirely by observers, who reported what they saw below. As time went on, however, it was found that the photographic eye of the camera was better adapted for many purposes than its human counterpart. The photograph was accurate, it covered a wide field, it could be kept for an indefinite period of time, and the comparison of a series taken at intervals indicated interesting developments that could be observed better in this manner than in any other.

Aerial photographs fall into two principal categories, known as "obliques" and "verticals." Oblique photographs, the kind with which the public is most familiar, are taken by pointing the camera over the side of the aeroplane, and they show the view as it would appear if taken from the top of a high building. Those of most value are usually taken at an angle of approximately 30 degrees below an imaginary line running parallel with the Earth's surface and passing through the centre of the camera. They are particularly valuable in warfare for the purpose of familiarising not only the Air Corps but also ground troops with the areas over which they are to operate, and with the changes that are taking place from day to day. The uses of aerial photography in peace time are manifold. Maps made by this means have been used by city planning authorities in making provision for the future development of municipalities. Large areas of land have been mapped, and this method has also been used extensively in making preliminary reconnaissances over isolated tracts of country in which mineral deposits are being sought. Oblique photographs are frequently employed also for advertising purposes.

Vertical photographs are taken by means of a camera that frequently is mounted inside the fuselage of the plane and points downward through a hole in the floor. It is obvious that while it is almost impossible to keep the camera pointing steadily in a precisely vertical direction, any considerable deviation from such a position must result in distortion and lack of accuracy, particularly where a series of photographs is desired. The area covered by a single exposure is determined by the height of the aeroplane above the ground, and by the focal length of the lens used. It is often desirable to cover a larger surface. In this case the usual procedure is to take a succession of overlapping exposures at regular intervals, the prints from which are mounted in their proper position in relation to each other, thus forming what is known as a strip map or mosaic, which may cover a wide area of ground. When assembled with accurate controls mosaics may be utilised to form very accurate maps.

Another method of operation is the taking of composite vertical photographs. This consists of the assemblage of two or more aerial photographs made at one exposure by a multiple-lens camera, and printed and mounted in such a manner that the assembled photographs form the equivalent of one taken with a wide-angled lens. The camera used has one lens pointing vertically downward, and two or more lenses pointing in an oblique direction. The resulting oblique photographs are projected into the plane of the vertical photograph by means of a special transforming printer. The advantage of this camera is that, with three lenses tangent to a wide arc, it covers a very wide territory. For instance, at an altitude of 15,000 ft., the field of view is 9.4 miles across. Cameras of the type used in making composite vertical photographs ordinarily have three or four lenses, although in one that has been experimented with the number has increased to five.



An impressive view of the water front and the towering skyscrapers of New York as seen from an aeroplane.

Single photographs show objects in one plane; stereograms are overlapping pairs of either vertical or oblique aerial photographs. Their value lies in the fact that they will show up the relief in a photograph, and enable us to see it just as we should see the object itself. Stereoscopic photography employs the principle underlying binocular vision. The human eyes are about $2\frac{3}{4}$ in. apart, and this double vision gives us a sense of relief or depth in all objects we view up to a certain distance. Beyond this distance, the two eyes receive visions that merge, and we receive an impression more like a single photograph than a stereoscopic view.

The ordinary stereogram is produced by photographing an object with a camera having two lenses approximately 3 in. apart. This gives a double or overlapped picture of the object, which, when viewed in a stereoscope, is reproduced to the eye as a single photograph that gives the sensation of relief. In aerial photography the same principle is employed, but it is exaggerated. In taking

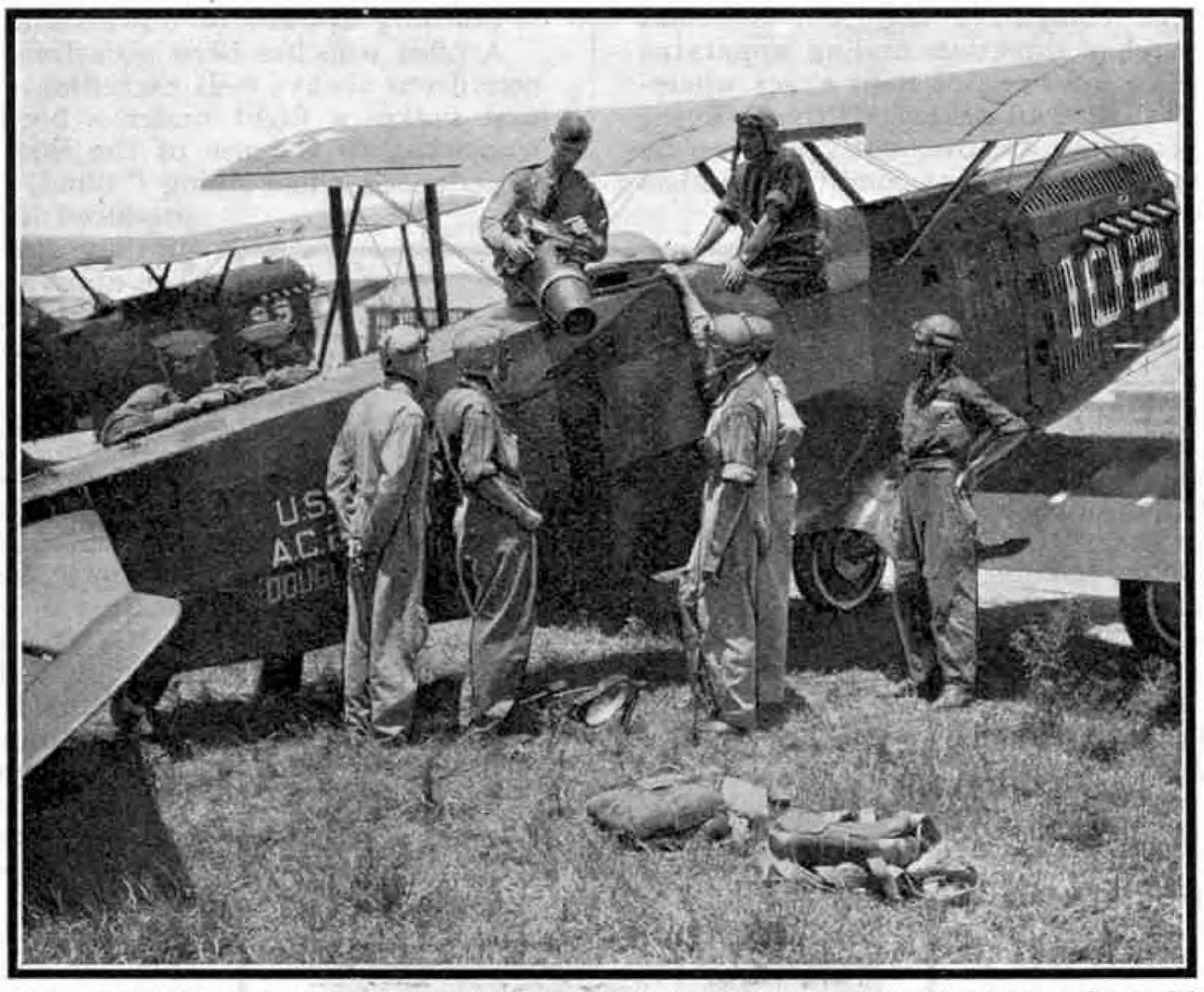
pictures in the air, owing to the distance from the lens to the object photographed a double-lens camera with lenses several inches apart would not produce this stereoscopic effect. For that reason in aerial photography the effect is obtained by taking two photographs at some distance apart from the same altitude. Overlapping photographs show exactly the same area, but slightly different views of it. When these two pictures are viewed through a stereoscope on their proper sides in the order in which they were taken, the stereoscopic effect is obtained. In this manner relief of buildings, depth of valleys, and all such features are immediately brought out and understood; and it will be obvious that stereograms are a great aid in the interpretation of aerial photographs, as they enable the relief of the ground to be realised.



Students at work laying aerial photographic mosaics in the Department of Photography of the United States Air Corps Technical School, Illinois. For permission to reproduce this photograph and the one below we are indebted to the U.S. Army Air Corps.

The cameras used are the result of much ingenious development. The one generally used in taking "verticals" contains a long roll of film, and exposures are made automatically at intervals previously determined, ranging from 10 to 90 seconds between each photograph. This interval will be determined by the air-speed of the machine; the strength and direction of the wind, which determines the machine's ground speed; and the altitude at which the photograph is taken. There is also a device for notifying the pilot and the observer a few seconds before the time of exposure, thus allowing the pilot to level the machine and the observer to maintain the axis of the camera in a vertical position. The automatic device may be disconnected, and the exposures made when the observer desires.

The machines used for aerial photography are specially designed, and the United States Air Corps have purchased for the work a number of Fairchild single-engined cabin aeroplanes. Camera mountings are important fittings. It is necessary that they should eliminate vibration as much as possible, and in the case of vertical photographs enable the observer to keep the camera axis as nearly as possible in the vertical position. Sponge-rubber pads and shock absorber cord are generally used to dampen vibration. The pilot should have special training in the technique of flying a photographic machine, for it is only after considerable experience that the best results are obtained. Further, in order to achieve success, the pilot and the photographer should have worked together in order to be thoroughly familiar with each other's methods.



U.S. Army Air Corps cadets receiving instruction in the mechanism and use of a camera for aerial photography.

While it is not directly used in aerial photography, an interesting development of the use of photography in aircraft is the gun camera and time-registering device. This is used for the training of men in the use of machine guns, and is mounted in connection with the gun. When the trigger is pulled, instead of bullets being fired, a series of photographs are taken that show the number of hits that would have been made if ball ammunition had been used. In the case of a sham fight between two or more aircraft, the time-registering device shows the exact moment at which the first vital shot was fired, thus enabling the winner of the combat to be determined.

One of the foremost in the development of high altitude and distance photography is Captain Albert W. Stevens of the United States Air Corps, who, with Captain St. Clair Streett, bears the distinction of having reached the highest altitude ever attained in an aeroplane carrying two occupants—37,854 ft. Photographs taken at this height cover a tremendous area, as much as 33 square miles, nd are remarkably clear as regards detail, permitting of enlargements being made up to 10 diameters. At such high altitudes, owing to the thinness of the atmosphere, human life can be sustained only by the use of oxygen, which is carried in the machine. Very low temperatures also are encountered, running to as much as 60 degrees or 70 degrees below zero. At first sight, exploits of this kind may appear to have little value, but they are nevertheless of decided importance. At such altitudes, five miles or more, aeroplanes are inaudible, and except in certain cases when the moisture in the exhaust is frozen into a kind of cloud streamer, they are also invisible. Photographs thus could be taken over enemy territory without the presence of the aeroplane being suspected.

Closely allied with high altitude photography is photography at long range. Photographs taken by the Air Corps in April 1930, from an altitude of 20,000 ft. over a point near Crater Lake, Oregon, show distinctly Mt. Rainier in Washington, an air-line distance of 270 miles. The mountain was not visible to the human eye because even on clear days the atmosphere contains sufficient haze to limit vision to less than 27 miles. These remarkable results are obtained by the use of special film sensitive to the invisible infra-red rays that penetrate smoke and haze, and by special filters placed over the lens.

Another branch of aerial photography in which the Air Corps has made remarkable progress is in the taking of photographs at night. Such photographs are made by firing a large charge of magnesium powder, with automatic means for tripping the camera shutter at the point of maximum intensity of the flashlight. If the camera shutter were to remain open for any considerable length of time awaiting the flash of the magnesium bomb, the resulting photograph might show a blur caused by lights on the ground, especially in the case of night photography of a well-lighted city. The magnesium flash bomb is released from the aeroplane, and it explodes after the expiration of a predetermined time.

Along with the development of night photography has come the working out by the Air Corps of a (Continued on page 462)

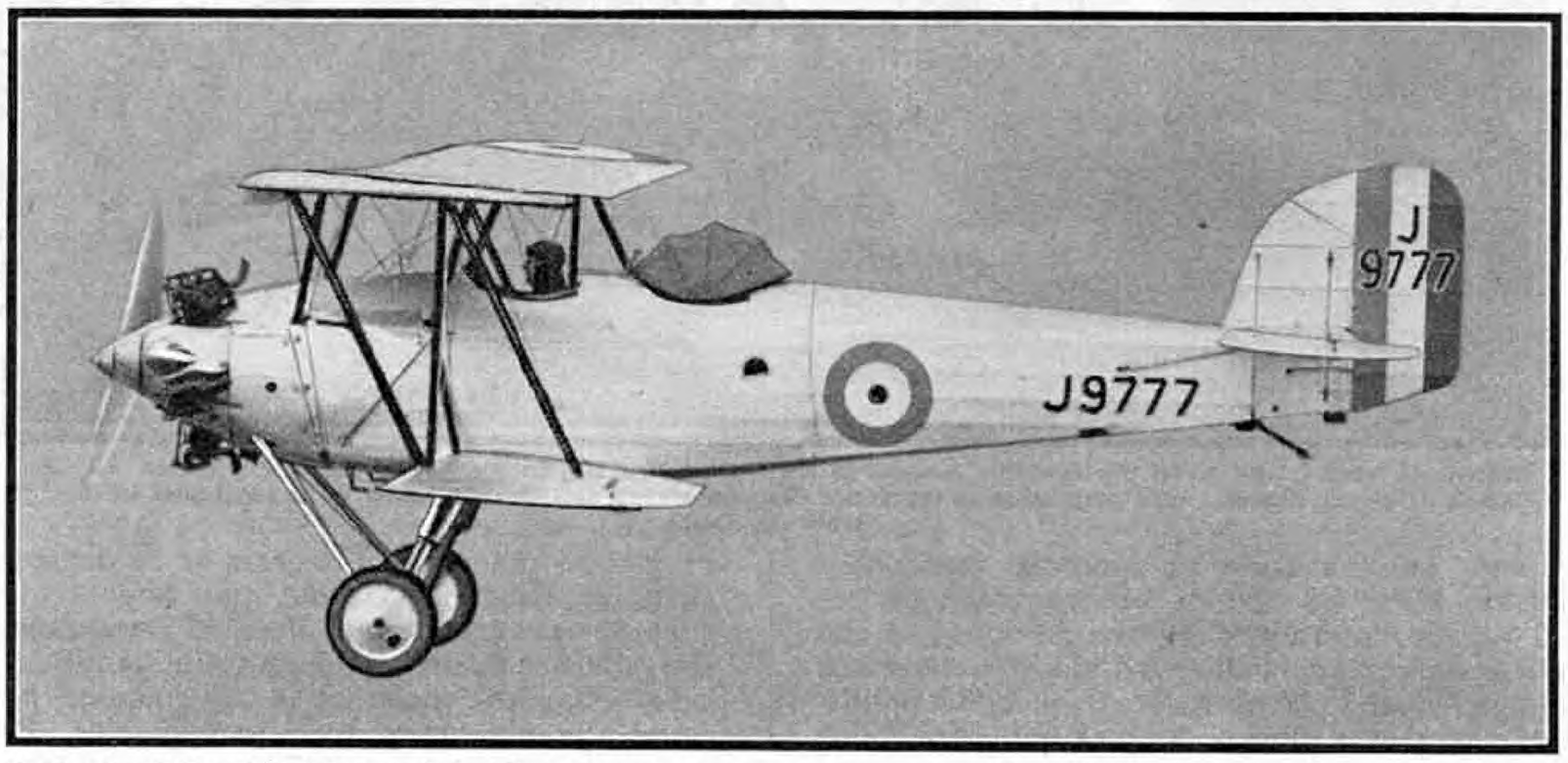
Air Transport in all Weathers

The Science of "Blind Flying"

IN the past one of the greatest disadvantages of air transport has been that it depended so much on the weather, and even if only a moderate breeze sprang up it was often impossible for aircraft to be brought out from the hangar. Nowadays however aircraft, particularly large commercial machines, can be operated when extremely bad weather conditions are prevailing. For example, on more than one occasion Imperial Airways services between England and the Continent have been carried out regularly and punctually when it has been impossible for any of the boat services to be maintained, or even for vessels to put out from port.

Commercial air lines are of course staffed by men who have had the benefit of many years of experience of flying under all conditions, while the companies maintain excellent meteorological services and wireless direction finding apparatus by means of which pilots may be informed of their exact whereabouts in less than two minutes' time of asking. Private flying and air taxi work, on the other hand, are frequently held up by the presence of low cloud or fog, for under these conditions, unless a pilot has had special training, it is unsafe for him to venture on even a short cross-country flight. The reason for this is that when a pilot who has no knowledge of what is known as "blind flying" becomes lost in the clouds, all his normal senses of direction and position appear to desert him. More than one pilot who has been flying through clouds has found to his surprise on reaching the clear air that he has been flying upside-down for some time! An inexperienced pilot is also in great danger if his machine should go into a spinning nose dive while among the clouds, for immediately he neutralises his controls—the normal method of getting out of a spin—his sensations are that he is beginning to spin in the opposite direction. Even if he should be successful in flattening out, it is probable that he will overdo this, stall his machine, and commence another nose dive.

Every pilot who wishes to be able to carry out cross-country flights in any but the best of weather should endeavour to take a course of tuition in "blind flying." Training of this kind is carried out in special aeroplanes that are provided with duplicate sets of instruments, and in which the rear cockpit may be covered by a special hood through which it is impossible for the pilot to see. The hood allows a certain amount of light to creep in, however, as it is found that this reproduces more closely the normal effect of fog or clouds than if the pilot were to sit in complete darkness and have his instruments illuminated by electric lights.



A Hawker "Tomtit" being used for blind flying training. For permission to publish the photographs on this page, we are indebted to the courtesy of the Editor of "Flight."

When flying under normal conditions the pilot of a civilian machine does not usually pay a great deal of attention to his instrument board. He must of course occasionally glance at his air speed indicator, revolution indicator and altimeter, but he usually navigates his machine by identifying landmarks noted on a map. When a flight is being made "blind," however, he must pay great attention not only to the normal instruments, but also to special instruments known as the turn and bank indicator and the pitch indicator respectively. The turn and bank indicator shows when the machine is turning and banking, and the latest type of instrument indicates also when it is side-slipping. The pitch indicator shows whether the nose of the machine is pointing upward or downward.

A pilot who has been accustomed only to flying under normal conditions always feels exceedingly "lost" and confused when he first makes a flight under a hood. In order to accustom him somewhat to the use of the instruments, and to the sensation experienced when flying "blind," a special apparatus has been produced in which the pilots may undergo all these sensations while still on the ground. The apparatus is similar to the well-known Reid and Sigrist aptitude indicator, but it is covered over and, by very ingenious methods, the controls are all given the "feel" that they have when an aeroplane is flying. The instruments can be made to behave just as they would if the machine were to be put into various attitudes, even the compass needle moving in a very realistic manner. The actual manipulation of the indicators to bring about imaginary attitudes of the machine is under the control of a tutor, who sits just behind the pupil. The apparatus is not intended to shorten the length of time required to learn blind flying, but it is expected that it will enable students to take better advantage of the time they spend in the air.

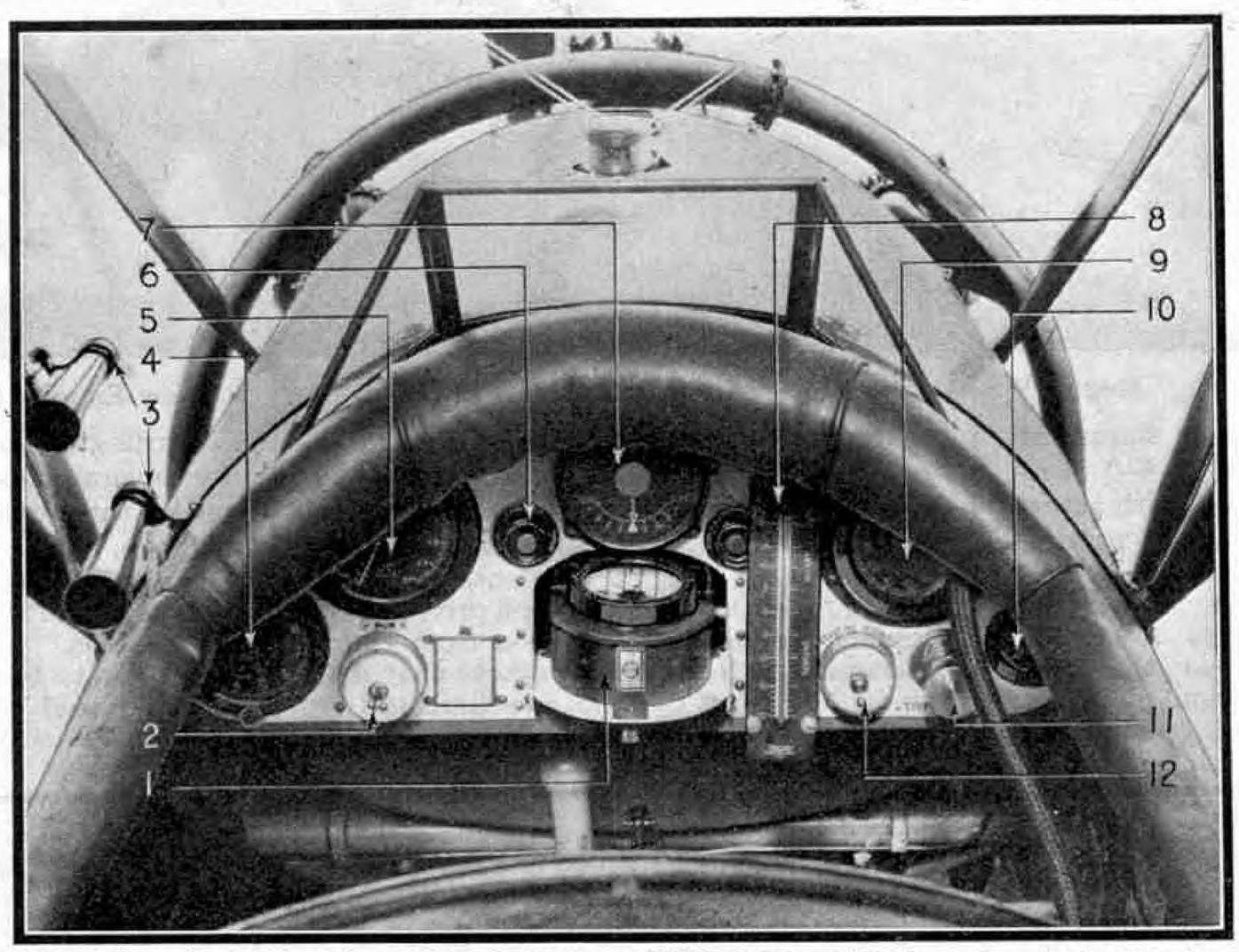


The special training apparatus on which students of Air Service Training Ltd. practice before making their first blind flight.

One of the most modern turn and bank indicators is that constructed by Reid and Sigrist, and some idea of the work that has gone to the production of this may be gained from the fact that the instrument has been tested in 25 different machines over a period of two-and-a-half years. The latest model consists of a dial that is graduated to take two pointers, one being known as the turn indicator and the other as the side-slip indicator. The side-slip indicator consists merely of an air-damped pendulum that works inside a fan-shaped casing, arranged so that when the pendulum swings from side to side, the air in the casing must be displaced from one side of the casing

to the other. A small portion of the pendulum extends above the pivot point, and this is connected to the lower end of the indicator needle. Thus when one wing of a machine in which the instrument is fitted is lower than the other, the pendulum moves over to the lower side and in turn moves the indicator needle, warning the pilot to correct the machine.

The turn indicator is of the gyroscopic type. It consists of a gyro wheel on the circumference of which there are several small cups. Air is forced into these cups by the passage of the machine through the air, and this is sufficient to keep the wheel turning. The gyroscope is mounted in gimbals and is connected by a system of gearing to the indicator needle on the dial, so that when the machine turns the gyroscope is affected, and the movement is shown on the indicator. The pitch indicator, or inclinometer, usually consists of a vertical length of glass tubing inside which is some coloured liquid that rises and falls as the aeroplane climbs or dives. A scale is provided at the side, and when the liquid is opposite the O mark the machine should normally fly level. In many cases, however, the aeroplane will tend to climb slightly when the liquid is at this level, and consequently the readings of the other instruments on the dashboard of the machine must be taken into consideration when the pitch indicator is read.



This photograph, published by courtesy of Armstrong Siddeley Motors Ltd., shows the cockpit of an Avro training machine adapted for blind flying. The instruments shown are :—1. Compass ; 2. Running Switch ; 3. Venturi Tubes ; 4. Altimeter ; 5. Revolution Indicator ; 6. Oil Temperature Indicator ; 7. Turn and Bank Indicator ; 8. Pitch Indicator ; 9. Air Speed Indicator ; 10. Oil Pressure Gauge ; 11. Doping Pump ; 12. Starter Switch.

Before a pilot is taken up for his first blind flight, the action of the instruments and the method of working out courses are fully explained to him, and he spends a certain amount of time in the "tutor" in order to become familiar with the instruments. The method of training that has been adopted enables a pilot to build up his efficiency in stages. He starts by learning how to use the rudder alone, then the elevator alone, and then the ailerons alone, the instructor looking after the other controls in each case. Gradually any two of these are combined, and finally all three controls are taken over. In normal cases co-ordination should be achieved after about eight hours. Skill in blind flying can only be attained by experience and the development of concentrative powers not usually called upon in flying. No pilot's technique is complete without a reasonable degree of skill in this direction and the pilot who claims to be able to fly blind should be capable, when entirely blinded, of taking off, climbing, flying really straight and level, turning to change course as often as desired, spinning and recovering, recovering from any attitude without any unnecessary loss of height, gliding and correcting for nose and tail heaviness or lack of lateral trim. In spite of the formidable appearance of this list, results that have been attained show that the average pilot is capable of achieving this standard with proper training.

When a fully trained blind-flying pilot is given a course to fly blind, say a triangle, he calculates the distance between the three points, the compass directions in which they lie, and the time that it should take him to fly between them, making due allowance for the speed and direction of the wind. He takes off directly into the wind and then makes for the first turning point, endeavouring to keep all the pointers on his instruments at zero. If any pointer moves in either direction he directs the aeroplane back on to its course until the needle is at the correct place. The pilot makes his machine cruise at a standard speed, and after he has been flying for the predetermined period of time decides that he should be over the turning point and turns, carefully watching his instruments while doing so, and endeavouring to forget his normal reactions to the feel of the machine. If the calculations are carefully worked out and the instruments obeyed during the flight, it is astonishing how accurately the course decided upon may be followed. One student of Air Service Training Ltd., the foremost blind-flying training school in England, summed this up after successfully completing a blind flight by exclaiming how easy it was to "hit the mark by doing the sums!"

It is not usual for Imperial Airways air liners to be navigated entirely by "dead reckoning," for on the Company's routes between Croydon and Le Bourget the machines are able to obtain their bearings when necessary by means of wireless direction-finding apparatus installed at Pulham, Lympne, and Croydon. When an aeroplane sends out a call for bearings, its direction from each of these three stations is ascertained by means of an instrument known as a radio-goniometer. The bearings from Pulham and Lympne are immediately transmitted to Croydon where they are plotted on a map, and in about two minutes the pilot is informed by wireless of his exact whereabouts. By the aid of this apparatus flights have been made between London and the Continent during which the pilots have scarcely been able to see the ground throughout the whole of the journey.



Mr. H. J. Horsey, a pilot of Imperial Airways, speaking into a Marconi microphone fitted in the cockpit of the Handley Page machine, "Hadrian." Our photograph is published by permission of Marconi's Wireless Telegraph Co. Ltd.

Reliable as the normal Bellini-Tosi apparatus has proved under these conditions, however, wireless direction-finding has been subject to errors during the hours of darkness, and particularly at sunset and sunrise, on account of the natural phenomenon of the irregular polarisation of wireless waves at these times. Realising the importance of providing a direction-finder capable of giving accurate bearings at all times of the day and night, particularly in view of the probable extension of night flying services in the near future, the Marconi Wireless Telegraph Co. Ltd., have developed a direction-finder in which this "night effect" is overcome.

The new apparatus is known as the (*Continued on page 462*)

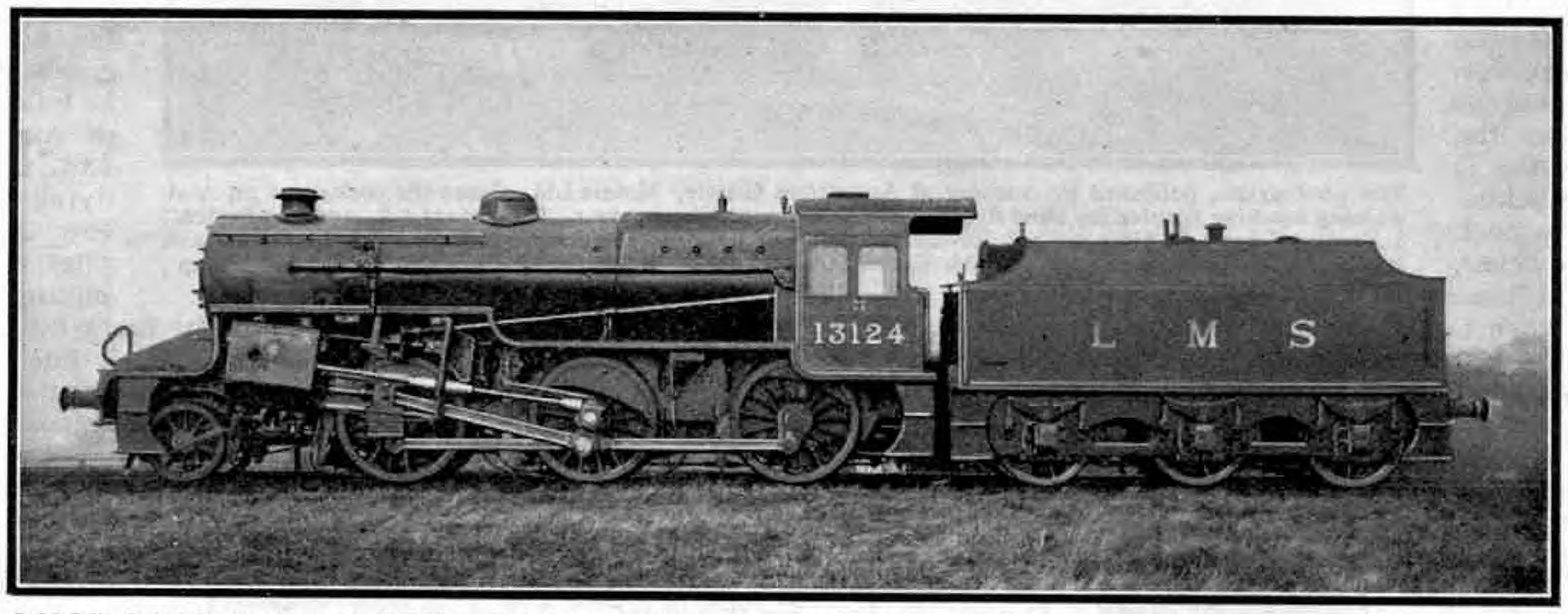


Lentz Valve Gear on L.M.S.R. "Moguls"

The illustration on this page shows one of five standard L.M.S.R. 2–6–0 locomotives that have been fitted with rotary cam valve gear of the Lentz pattern. This valve gear is used to operate poppet valves placed horizontally above the cylinders, and its object is to reduce maintenance costs, giving at the same time an improved distribution of steam. Their performances are being compared with those of similar locomotives having the usual Walschaerts valve gear and piston valves.

The construction of this class was commenced at Horwich in 1926, and the engine illustrated is No. 13124, built in 1929 and allocated to the Midland Division. The piston valves of the standard engines are 11 in. in diameter and have a maximum travel of 6½ in. They are operated by Walschaerts valve gear. Cylinders having a bore of 21 in. and a stroke of 26 in. are fitted, and the driving wheels are 5 ft. 6 in. in diameter. The boiler supplies steam at 180 lb. per sq. in. and the tractive effort at 85 per cent. of the boiler pressure is 25,580 lb.

The results of these experiments with Lentz valves and gear will be watched with interest in view of the trials also being made on the L.M.S.R. with Caprotti poppet valves. These valves have been fitted to 10 of the 20 rebuilt "Claughtons," the other 10 retaining the usual piston valves and Walschaerts motion.



L.M.S.R. 2-6-0 locomotive No. 13124. This is one of the five engines of this class that have recently been fitted with Lentz poppet valves and rotary cam gear. For this photograph we are indebted to the courtesy of the L.M.S.R.

G.W.R. Locomotive News

The famous express locomotive No. 6000 "*King George V*" is now back in traffic after a visit to Swindon works, where the boiler, wheels, pistons, valves and other important parts were dismantled to enable a complete overhaul to be made.

Another four-cylinder engine of the "Star" class—No. 4034 "*Queen Adelaide*"—has been fitted with new outside steam pipes similar to those on engine No. 4002. Four of the engines of this class have now been equipped with these special pipes to the outside cylinders.

Several more 4–4–0 engines of the "County" class have been broken up.

London "Underground" Extensions

Rapid progress has been made with the extensions at both ends of the Piccadilly Railway, the weather conditions during the past winter having been exceptionally favourable. A London representative of the "*M.M.*" who has recently been privileged to inspect the western extension from Hammersmith to Northfields, reports that it is so far advanced that the new lines will be brought into use as far as Acton Town in July next. The track from thence to Northfields will be completed shortly afterwards and there will then be a four-road track from Barons Court to Northfields. Two of the roads will be used by District Railway trains and the other two by Piccadilly "tube" trains. Between Ravenscourt Park and Turnham Green some disused Southern Railway track has been requisitioned by agreement with that Company. It is intended to run through trains from the Piccadilly line via Northfields over the District Railway to Hounslow, and also via Acton Town and the District Railway to South Harrow.

Much of the work on the extension has been of a difficult and complicated nature but surprisingly little delay has been caused to the train services already operating. The total cost of the scheme will be about £3,300,000.

The stations on the lines affected by the extensions and alterations are being brought up-to-date, and even on the old District line to South Harrow some of the stations have already been rebuilt in readiness to cope with the increased traffic that is expected. The stations at Ealing Common and Sudbury Town, which were visited by the "*M.M.*" representative, are particularly striking. Differing considerably in design, both equally combine a pleasing "modern" appearance with efficiency in operation.

New Express Locomotives on L.N.E.R.

Darlington works have been engaged for several months past on a new series of 15 three-cylinder 4–4–0 express locomotives, and the first has now been completed and put into service. It is numbered 201 and named "*The Bramham Moor.*" All the engines of this series are to be named after famous hunts and they will have brass name-plates, of a new design, surmounted by the figure of a running fox. All will be fitted with Lentz rotary cam valve gear. The new "Hunts" are, of course, a continuation of the "Shires."

At Doncaster the order for 28 three-cylinder 2–6–2 tank engines of the new class VI has been completed, the last of the series being numbered 2927. A new batch of the standard three-cylinder 2–8–0 heavy freight locomotives has been put in hand.

A "Royal Scot" for American Exhibition

Further standard 0–8–0 freight locomotives have been completed at Crewe and are numbered 9653 to 9658. Derby works have continued to turn out 4–4–0 locomotives of Class 2, and Nos. 676 to 683 are now in service.

The reconstructed "Claughton" No. 5902, "*Sir Frank Ree,*" has been in the shops for repairs. Further dynamometer car tests are to be made with this engine. Fifteen more engines of this type are under construction and it is understood that they are intended to work chiefly on the accelerated services on the Midland section.

A "Royal Scot" locomotive and some passenger coaches of the newest types are to be exhibited by the L.M.S.R. at the World's Fair to be held next year at Chicago, U.S.A.

Colour Light Signals on S.R. Main Line

Colour light signalling is being installed on the S.R. line to Brighton, now being electrified. As yet the existing semaphore arm signals are being used for the regular services, but the new signals are being tried out by a special train, and eventually will supersede the present system.

London to Edinburgh in 7½ Hours

The travelling public in general, and railway enthusiasts in particular, will welcome heartily the remarkable accelerations in British train services that came into force on Monday, 2nd May, and the further improvements that are promised when the summer services are introduced in July. The successful speed trials that have been chronicled in recent issues of the "*M.M.*" have, indeed, now resulted in very substantial improvements in the regular services.

It is especially gratifying to record that at last the agreement that fixed the minimum time between London and Edinburgh or Glasgow at 8¼ hours has been set aside, and on both the L.M.S.R. and the L.N.E.R., the principal day services in both directions, between London and the chief Scottish centres, have been speeded-up considerably. Thus on the L.N.E.R., the "*Flying Scotsman*" now reaches Edinburgh in 7 hrs. 50 min., while on the L.M.S.R. the "*Royal Scot*" takes 8 hrs. to Edinburgh and 7 hrs. 55 min. to Glasgow. When the non-stop trains are put on again in July, these times will be further cut and the "*Flying Scotsman*" will cover the 393 miles between King's Cross and Edinburgh in 7½ hrs. On the L.M.S.R. the "*Royal Scot*" will perform the journey of 401.4 miles from Euston to Glasgow in 7 hrs. 40 min. In both cases the average speed will be 52.4 m.p.h.

The mid-day services between London and Scotland have been similarly accelerated. The new schedules give quicker timings between many English provincial towns and cities and both London and Scotland, whilst north of the Border, Stirling, Perth, Dundee, Aberdeen, and numerous other places share with Edinburgh and Glasgow the benefits of the improved services.

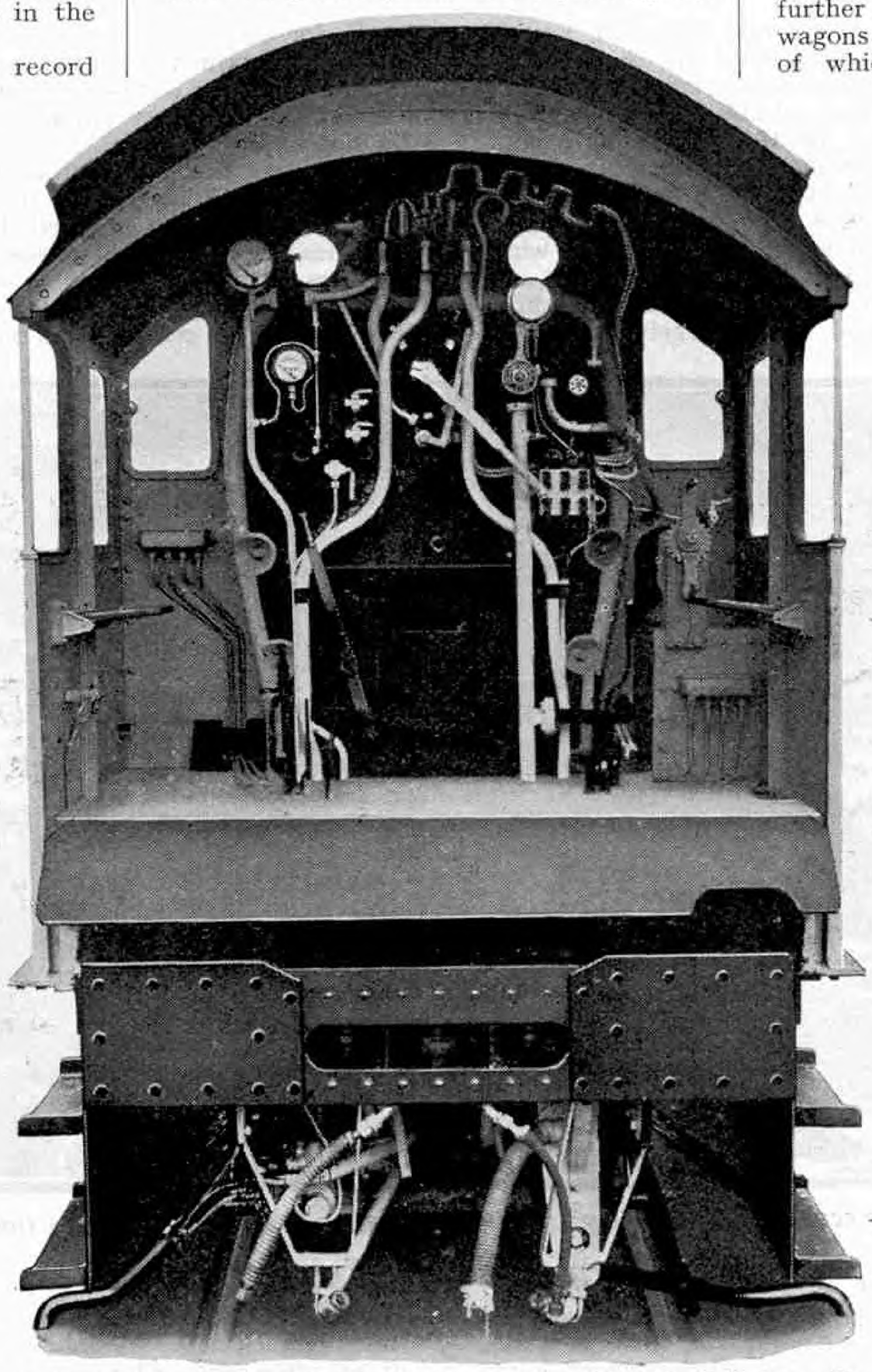
The new schedule of the "*Queen of Scots*" all-Pullman express is worthy of special mention, as the already sharp timing between King's Cross and Leeds has been cut in both directions, the down train now being allowed 196 min., and the up train 195 min., for the non-stop run of 185.7 miles, requiring an average speed of 57 m.p.h. The overall time between London and Edinburgh is now 8 hrs., a reduction of 20 min.

On the Midland section of the L.M.S.R., a notable acceleration has been made in the timing of the 9 a.m. from St. Pancras, which has been speeded up to arrive at Edinburgh ahead of the "*Flying Scotsman.*" For the run of 123.5 miles from London to Nottingham, only 129 min. are allowed and an average speed of 57.4 m.p.h. is demanded. Between Leeds and Carlisle, including a stop at Skipton, only 127 min. are allowed for the 112½ miles, many of which are steeply graded. Altogether between London and Carlisle, 20 min. are gained.

The most remarkable accelerations of all have been made on the G.N. section of the L.N.E.R.—a section that has always been distinguished for speed. The 8.30 a.m. from Grantham to King's Cross is now allowed 118 min. for the 105.4 miles, including four stops! For the last stage of 58.9 miles from Huntingdon to King's Cross, the allowance is only 57 min., involving an average speed of 61.6 m.p.h. But even this smart schedule is eclipsed by that of the up breakfast-car train leaving Leeds at 7.50 a.m., which now takes only 3½ hrs. to reach London, with four stops en route, and dashes off the final break of 105.4 miles from Grantham in precisely 100 min., yielding an average speed of 63.2 m.p.h., start to stop!

In addition to the principal accelerations noted above, a great number of other improvements have been introduced by the various railway companies. Between King's Cross and Cambridge, for instance, five additional express trains have been put on in each direction. A new standard of comfort has been set in these trains; arm-rests are fitted in the third-class coaches and each train has a buffet car.

The G.W.R. announce that, with the introduction of the summer timetables, accelerations totalling 6,466 min. daily will be effected, principally in branch line and local services. Main line services on this system have already reached a notably high level in regard to speed, and in their case further accelerations are less necessary.



A striking view of the footplate of a G.W.R. locomotive of the "Castle" class. The extended cab roof, side windows and seats illustrated are customary on most modern locomotives, and add considerably to the comfort of the crew.

S.R. Building Programme

The Southern Railway intends to keep up-to-date and the directors have authorised another programme of new construction. It provides for the building of 10 more 4–4–0 engines of the "Schools" class, and for the construction of 260 passenger coaches, most of which will be nine feet in width over the body. Ten restaurant cars with kitchens are also to be built. The new programme further includes no less than 1,000 goods wagons and vans of various types, many of which will be fitted with vacuum automatic brakes for use on express services. The whole of these vehicles will be constructed at the Company's own works at Eastleigh, Ashford and Lancing.

The Day's Work of a Veteran Locomotive

The two Stroudley 0–4–2 locomotives of the "Gladstone" class—Nos. 172 and 197—still remain at work on the Southern Railway. For some time past the duties of No. 172 have been of only a casual nature, but No. 197 is still putting in full time service although, naturally, not on main line trains. It is stationed at Brighton and regularly takes out the 9.13 a.m. train from that town, working through to Ashford via Lewes and Hastings. It returns on the 1.25 p.m. from Ashford and reaches Brighton at 3.38 p.m. With a new crew in control, it leaves Brighton again at 5.38 p.m. and goes via Crowborough and Tunbridge Wells to Tonbridge, where it is due at 7.41 p.m. It leaves again for Lewes at 9.12 p.m. Before returning home to Brighton, on Wednesday it makes two trips from Lewes to Uckfield and back, and on Saturday, one such trip. It then ends the day by running home light from Lewes to Brighton. Its usual daily mileage amounts to about 210 miles. Railway enthusiasts who desire to travel behind this historic locomotive should hasten to do so, as the time cannot be far distant when it will be withdrawn from service. No. 172 will probably cease work earlier.

L.M.S.R. Carriage Washing Machine

A new carriage washing machine that deals with an average of 172 vehicles a day and 1,030 vehicles a week has recently been installed by the L.M.S.R. at their depot at Cricklewood, London. The machine consists of two units, each driven by a 20 h.p. motor, and the drive is transmitted by belt and bevel reduction gearing to the eight drums or wipers. These are arranged in pairs on opposite sides of the track.

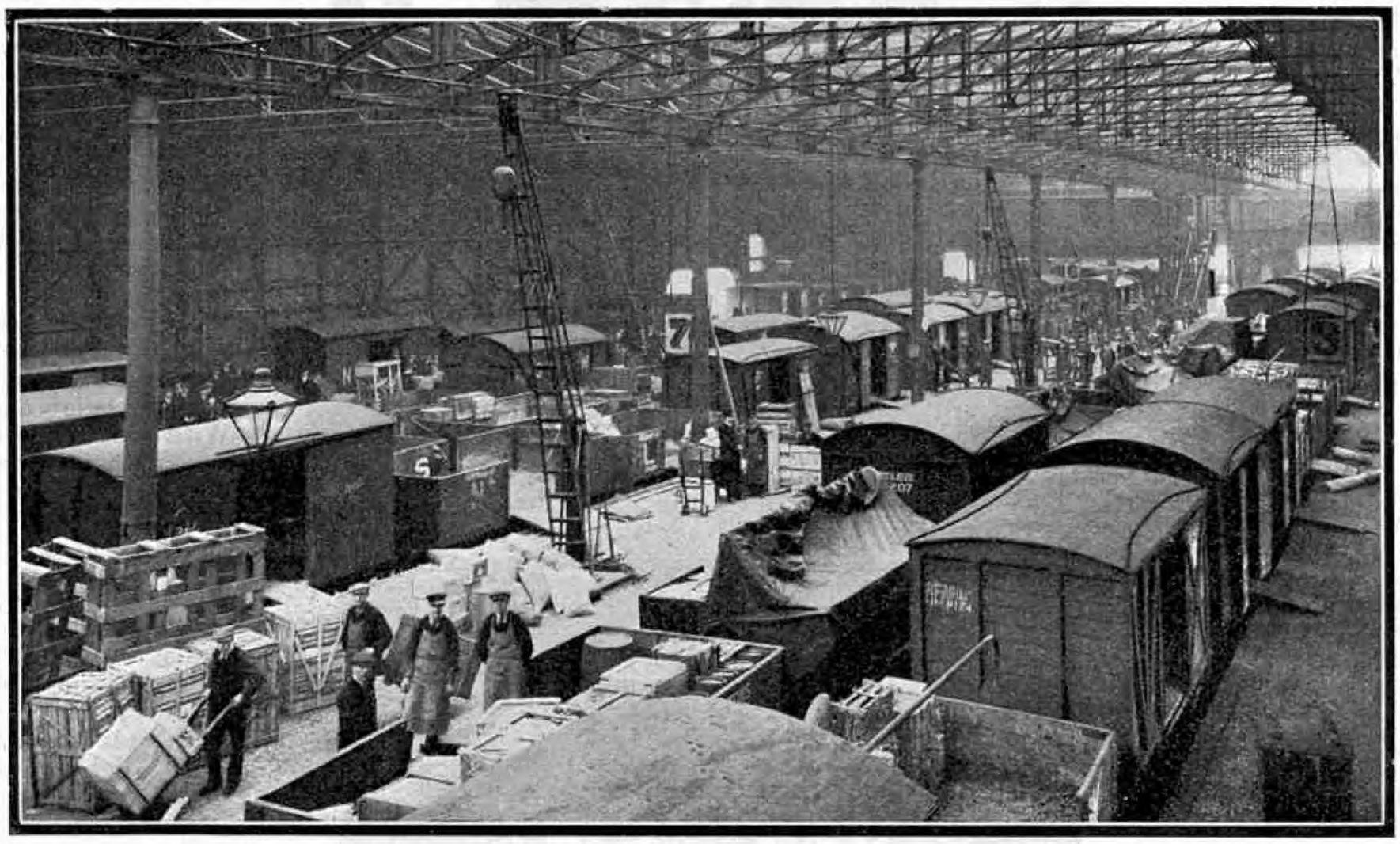
The dirt is removed by means of cloth or felt flaps secured to canvas holders, these being clamped to collars riveted to a vertical shaft that rotates at a speed of 50 r.p.m. Water is fed to the flaps through a perforated pipe fixed horizontally above the drums, and vertical spraying pipes are arranged to rinse the sides of the cars after they pass each drum. A final rinsing of clean water is sprayed on to each vehicle.

Work of the Railway Clearing House

Goods Traffic Handled By More Than One Group

THE more spectacular features of railway operation, such as long non-stop runs, high booked speeds, and the luxurious character of the main line express stock, are brought most prominently before the public; but actually the goods traffic produces a much greater revenue. In 1931 the total receipts from passenger traffic were £55,500,000; whereas the goods traffic in that year yielded £88,000,000. The humble mineral train standing in a refuge siding does more towards producing dividends than the magnificent express for the passage of which it has been shunted out of the way.

Goods trains on the whole attract comparatively little attention even from railway enthusiasts; and this is largely due to the fact that the vast majority of goods trains make their journeys at night. The greater part of this most important phase of railway work therefore takes place "behind the scenes." While we are enjoying an evening by the fireside, or sleeping in the quiet early morning hours, goods yards up and down the country are centres of amazing industry. All through the night, long heavy trains carrying merchandise and minerals are puffing out from goods yards and away into the darkness, bound for all parts of the country.



The scene in a busy railway goods warehouse at the peak of the daily rush.

From the moment when a consignment of goods reaches a receiving depot until it arrives at its destination, there is a vast amount of clerical work to be performed. Consignment notes have to be checked, traffic classified, and invoices made out and charged and sent on to the receiving station, where advices are prepared for the consignee. Daily returns have to be made out showing the inward and outward traffic of the day, and copies forwarded to the company's audit offices and to the Railway Clearing House.

For the moment let us follow a consignment of goods brought into a goods depot for despatch. The carter brings with him a consignment note that is handed to the checker receiving the "traffic." In addition to making sure that the details given on the consignment note are accurate, the checker enters all particulars of the consignment—name of consignor and consignee, weights and nature of traffic, the number of the truck into which the traffic is loaded, etc.—on his own forms, copies of which are sent on to the receiving station, occasionally with the consignment itself, but usually by passenger train. Another copy is passed to the clerical staff for the preparation of invoices and completion of returns.

Up to this stage we have considered the traffic as having been consigned to a station on the receiving company's own system, and consequently not calling for the use of another company's system. It would be safe to say, however, that somewhere between 35 and 50 per cent., possibly more, of the railway traffic calls for a transfer from one system to another. Obviously the revenue obtained from the carriage of such traffic cannot all be retained by the company on whose system it originated; a part is due to the other company or companies over whose tracks it has passed.

It is here that the Railway Clearing House plays its part. Its function is to apportion the revenue from that consignment among the companies that handled it. This is naturally a complicated business, and no good purpose would be served by describing the process in detail. It will be sufficient to state that the basis of allocation is the mileage covered over the systems of the companies concerned. A certain fixed sum, according to the nature of the traffic, is allowed for terminal expenses; or in other words the use of stations, loading and unloading, and clerical work.

The idea of the Railway Clearing House occurred in 1842 to a Mr. Morrison, who at that time was an audit clerk on the London and Birmingham Railway. In those days through traffic was dealt with by re-invoicing each item at the point where transhipment from one company's system to another occurred. In order to keep accounts the companies used to exchange receipts from different through traffic; but owing to the different methods of keeping such accounts that were adopted by different companies, it was often difficult for them to agree as to figures. Mr. Morrison's idea was for the formation of a central office that should receive the returns of the through traffic from all companies and arrange the balances due. The scheme met with the support of the then chairman of the London and Birmingham Railway, and after much discussion it was finally brought into operation. The first office was a small building near Euston Station, and the railways dealt with numbered four, with a mileage of 418.

The proceedings of the Railway Clearing House have been regulated by Acts of Parliament since 1850. Its authorised functions are "to settle and adjust the receipts arising from railway traffic within or partly within the United Kingdom, and passing over more than one railway within the United Kingdom, booked or invoiced at through rates or fares."

At the beginning the Clearing House clerks were few; to-day its staff numbers thousands, and it has representatives at more than 500 junctions throughout Great Britain. These representatives are at work day and night recording the number, owner's name, and destination, of every wagon, van, coach, and tarpaulin passing from the system of one company to that of another. These reports are passed to the Clearing House, where they are classified in marvellous detail, and from them is calculated the proportion of the revenue to which each individual company is entitled in respect of traffic that has passed over two or more companies' systems.

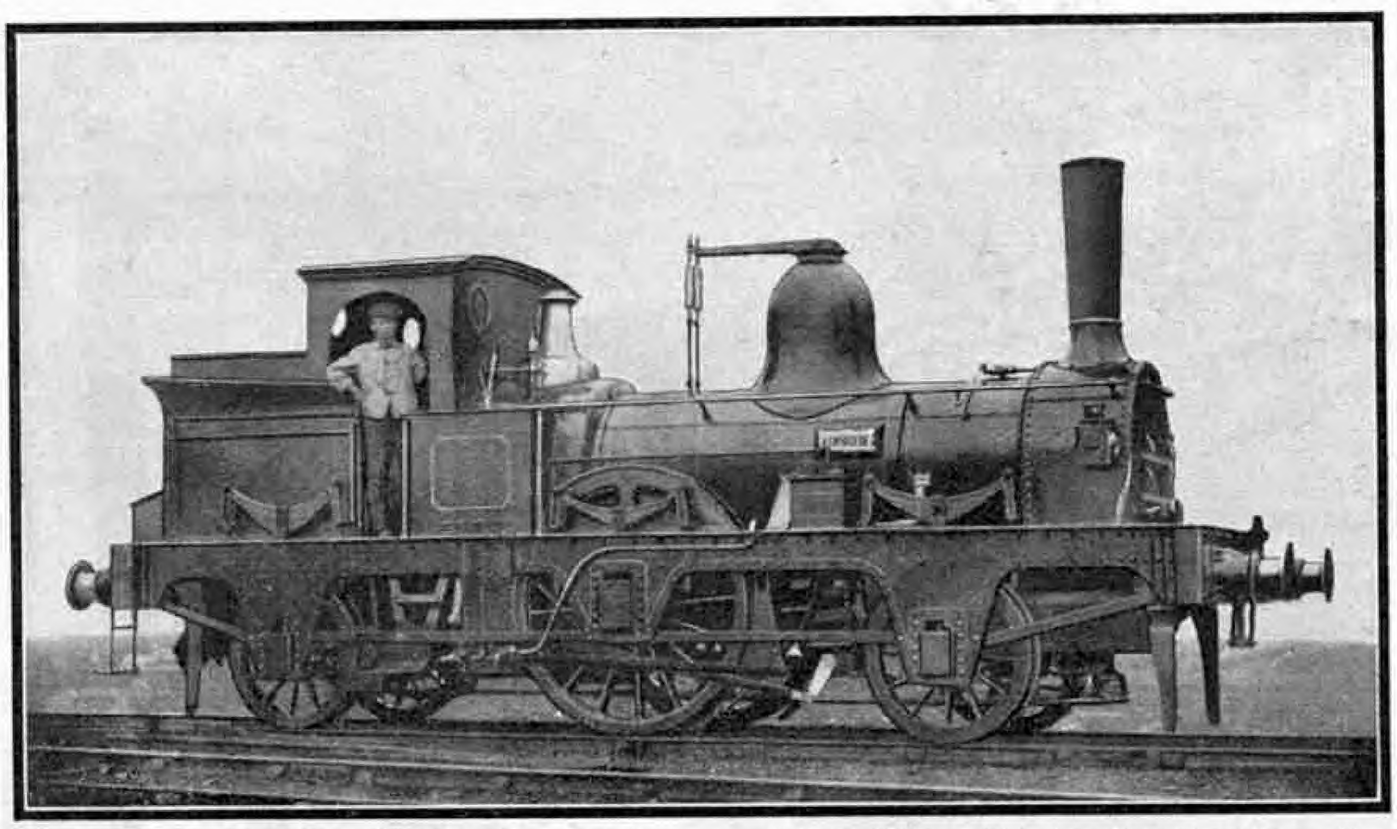
An Engine with a Remarkable History

The Leeds Northern "*Aerolite*"

By R. E. Bleasdale

A STRIKING feature of British railway policy has always been the manner in which locomotives have been retained in service as long as possible, re-boilering and general modernisation having taken place, perhaps on several occasions, during the life-time of many of them. Several classes of locomotives might be mentioned in this connection, but it is even more interesting to trace the history of individual engines. The well-known "single-drivers" "*Columbine*" and "*Cornwall*" that were exhibited during the Liverpool and Manchester Railway centenary celebrations in September, 1930, are good examples, for the originals first appeared in 1845 and 1847 respectively, and are now preserved at Crewe. In addition to the notable veterans housed in the York Railway Museum, the L.N.E.R. have in service a locomotive that probably has passed through more changes of design than any other, and which is of outstanding interest in many respects. This little engine is the "single-driver" No. 66, "*Aerolite*," of the former North Eastern Railway.

The original "*Aerolite*" was built in 1851 at Leeds by Messrs. Kitson, Thompson and Hewitson of the Airedale Foundry. It was a well-tank locomotive, and like many of its contemporaries was of the 2–2–2 wheel arrangement. During the "Battle of the Gauges" in the forties and fifties, when the broad gauge of 7 ft. 0¼ in. as laid down by Brunel on the G.W.R. strove for supremacy with the 4 ft. 8½ in. gauge used by Stephenson and adopted by most other lines, the six-wheeled "single-driver" had been evolved and had proved highly successful on narrow or standard gauge lines. As a result, many prominent locomotive building firms concentrated on that type of motive power, notable examples being the "Jenny Lind" design of E. B. Wilson & Co., and the well-known "Little Sharp" single-wheelers of Sharp, Roberts & Co.



The tank locomotive "Aerolite" in its second stage, as rebuilt in 1869. The general style of the engine and the pattern of the boiler mountings are characteristic of North Eastern practice of that period. The nameplate is visible below the dome.

Many of the older 2–2–0 locomotives had large trailing wheels added to make them six-wheelers, and therefore more steady in running; and although the G.W.R. had a number of 4–2–2 single express locomotives, they had also many of the six-wheeled arrangement, so that the 2–2–2 type was extremely popular.

The general design of "*Aerolite*" was similar to that of the "Jenny Lind" type that had been developed by Mr. John Gray in 1846 on the Hull and Selby Railway and afterwards on the Brighton Railway. This type, as produced in 1847 for the Midland by E. B. Wilson & Co., to the design of David Joy, rapidly became popular. "*Aerolite*" had a light frame with inside bearings for the driving axle, and outside bearings for the leading and trailing wheels. The heating surface of the boiler was 587 sq. ft., and the grate area 9.8 sq. ft.; the driving wheels were 6 ft. in diameter and the carrying wheels 3 ft. 6 in. The tanks held 500 gallons of water, and sufficient coke was carried for a journey of 50 miles. "*Aerolite*" differed from the "Jenny Lind" type in that the cylinders, which had a bore of 11 in. by 18 in., were outside, not inside the main frames. The engine was sent to the Great Exhibition of 1851 in Hyde Park where, resplendent in blue uniform, it vied for popularity with "*Lord of the Isles*," the G.W.R. masterpiece of David Gooch; Trevithick's "*Cornwall*"; "*Folkestone*" of the South Eastern Railway, an inside cylinder Crampton engine with an intermediate dummy crank axle; "*Little England*," another 2–2–2 well-tank built by George England & Co.; and "*Ariel's Girdle*," the first example in Great Britain of a motor coach or combined engine and carriage.

In 1852 "*Aerolite*" was acquired by the Leeds Northern Railway, formerly the Leeds and Thirsk Railway. It was stationed at Thirsk until the North Eastern Railway was formed in 1854, with Mr. Edward Fletcher as locomotive superintendent, when it was numbered 369 and used to haul his saloon. In this dignified service it continued unchanged until 1868, in which year, while hauling a special train at Otterington, it became involved in a collision that put it out of action for the time being. In the following year it was rebuilt at Gateshead, and then underwent a change in which the design of the original builders was to a great extent superseded by Mr. Fletcher's characteristic practice. It was given a large boiler and dome, a more capacious coal bunker, a covered-in cab, and a smaller chimney of the "stove-pipe" pattern. The framing was doubled, and the cylinders, which were now placed beneath the smoke-box, were enlarged to 13 in. diameter by 20 in. stroke. The driving wheels were reduced to 5 ft. 6 in., with outside axle-boxes, and the makers' plate was removed. The photograph reproduced on this page shows the locomotive as it then appeared.

In 1883, under Mr. Alexander McDonnell's regime, it was renumbered 1478; and two years later it became No. 66. It was again subjected to metamorphosis in 1886, when Mr. T. W. Worsdell was appointed locomotive superintendent at Gateshead. In May of that year it was renewed without a name, and lost all its original parts except the inside frame. The 2–2–2 wheel arrangement was retained, side-tanks were provided, and new outside framing of solid slotted-out plate took the place of the built-up frames shown in the photograph.

As pioneer of the two-cylinder compound system that he had previously applied to some extent on the Great Eastern, Mr. Worsdell made drastic changes in the motive power of the N.E.R., and in 1892 No. 66 was given a leading bogie and larger side tanks, and the Worsdell-Von Borries compound system was applied. In this method of compounding the two cylinders are cast together, and to make room for the larger low-pressure cylinder they are placed between the frames at different angles, so that one overlaps the other. By means of the valve motion—Joy's valve gear being employed in this case—high-pressure steam is first admitted to the smaller cylinder, after which, by means of a flap valve, it passes at a lower pressure to the larger one. In starting the engine the driver may admit steam to both cylinders simultaneously by the action of a hand-operated valve. In the "*Aerolite*" as thus altered the high-pressure cylinder was 13 in. in diameter and the low-pressure one 18½ in., the stroke of 24 in. being the same for both.

In 1902 the engine was again altered by Mr. Wilson Worsdell, the frames being reversed and the bogie placed under the footplate, thus making it into a 2–2–4 tank. Finally in 1907 its nameplate was restored, and the original makers' number placed on the bunker—the only parts remaining of the old locomotive of 1851. In 1921 its present boiler, with Ross pop safety valves, was fitted.

The other locomotives shown at the Great Exhibition were all broken up many years ago except (*Continued on page 462*)

Out-of-Gauge Traffic

How the Railways Handle Abnormal Loads

RAILWAYS have developed their freight-carrying organisation to such an extent that goods of every conceivable variety are handled and transported in enormous quantities as a matter of everyday routine. Ingeniously-designed wagons have been constructed to convey livestock, perishable goods, and other freights that require special treatment; and generally speaking any load can be dealt with quickly and easily, provided that it comes within the dimensional limits of the loading gauge of the line. An entirely new problem arises when the loads to be carried exceed these dimensions either as regards height or width. Traffic of this kind is known as "out-of-gauge" traffic. Fortunately there is not a great deal of it, for it causes a large amount of special preparation and is frequently the source of considerable anxiety to the officials in charge.

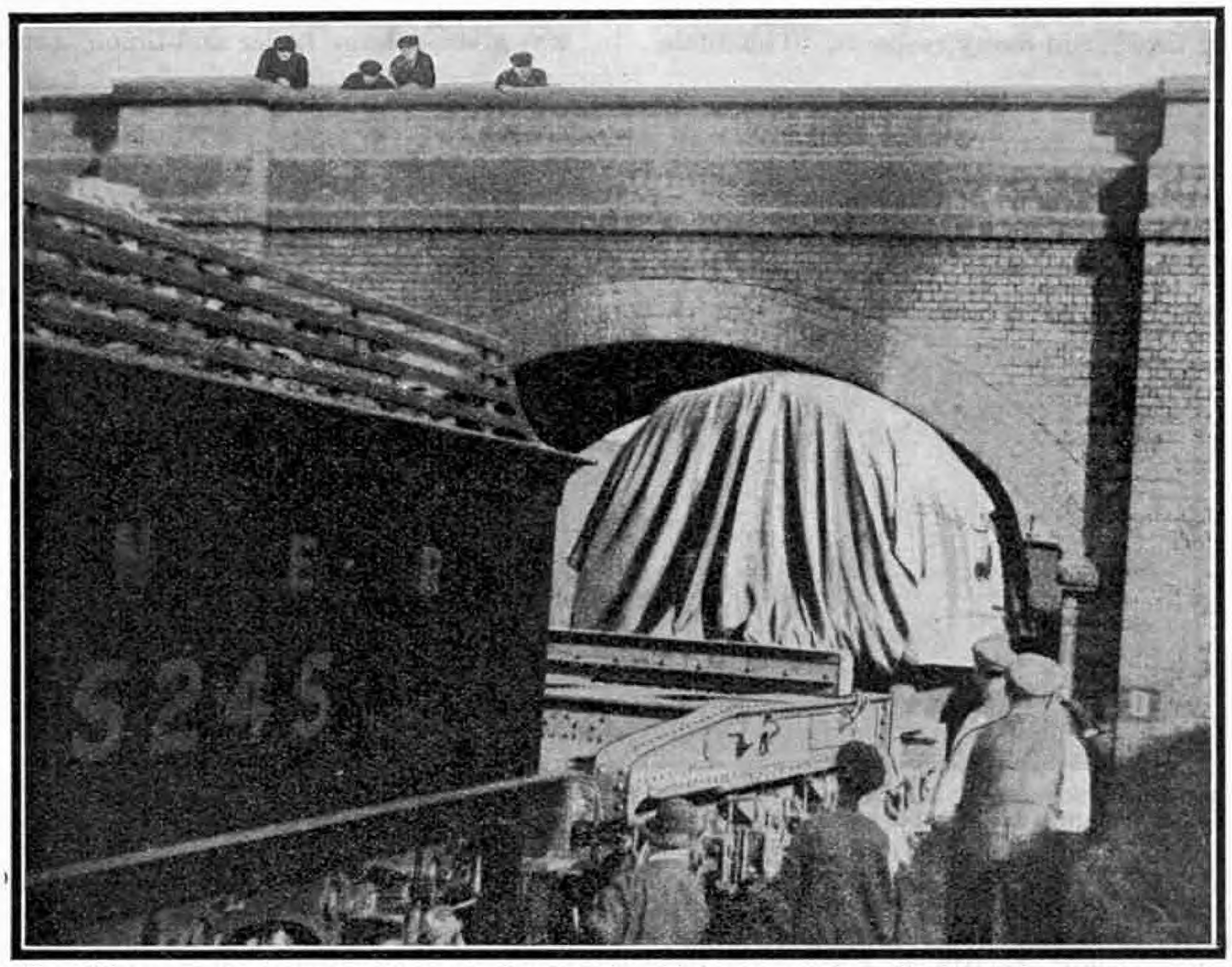
When a company is asked to convey a consignment that exceeds the maximum load dimensions, the station agent forwards to headquarters a drawing showing the exact shape and dimensions of the consignment, and the question of whether the task should be undertaken or not is carefully considered. Frequently the load exceeds the standard gauge only to such a slight extent that it can be conveyed as part of an ordinary goods train, special precautions being taken when the train is travelling around curves or over junctions. The real trouble arises in what is known as "total out-of-gauge" traffic, for which special trains have to be provided.

As a general rule "total out-of-gauge" traffic is handled only on Sundays when the ordinary traffic is at a minimum. The route to be followed is the first consideration, and this is carefully worked out to include the largest and most convenient bridges and tunnels, the easiest curves, etc. The result is often that an unusually bulky consignment may follow a very circuitous and apparently extraordinary route to reach its destination. In certain very exceptional cases, where a shade of doubt existed as to whether the traffic could clear certain points on the route, a template exactly reproducing the dimensions of the load has been constructed and run over the doubtful section of line. With this experience to guide them, the officials in charge of the consignment were forewarned against any special difficulties.

When the route is finally decided, notices giving the time of the train, the nature of the load and its dimensions are sent to every station through which the "special" will pass. As far as possible the train is timed so as to avoid encountering passenger trains en route. Sometimes this cannot be done, and in such cases the "special" must be brought to a standstill at a point where there is no curve of the line and where there is the necessary width between the up and the down tracks for the trains to pass. At some points there may not be sufficient clearance between the tracks and then it becomes necessary for the "special" to be shunted into a goods siding or on to a branch line well clear of the main and other running lines.

An inspector thoroughly conversant with the working of the particular line accompanies the "special," and he, and not the guard, is responsible for the safe working of the journey. If the "special" has to be handed over to another company before reaching its destination it is carefully examined by representatives of this company at the junction station before it is taken over.

Perhaps the best way of giving an adequate idea of the difficulties involved in "out-of-gauge" loads will be to take a typical case, such as that of the conveyance by the L.N.E.R. from Darlington to Middlesbrough of a new stern frame for the White Star liner "*Olympic*." Owing to its exceptional weight and dimensions the stern frame had to be constructed in two pieces, and even then each piece was of such size as to require a separate wagon. The larger piece was loaded on to a 70-ton trolley wagon and in order to keep it in position a 30-ton balance weight was placed on the opposite side of the truck. The overhang of this section of the frame on the "six-foot" side was 15 ft. 9 in. from the centre of the wagon, and on the platform side 6 ft., the total width being 21 ft. 9 in. The second portion was loaded on to a 40-ton trolley wagon and it overhung the "six-foot" way by 9 ft. 10 in. The maximum height of the load was 13 ft.



The 87-ton stator passing through the bridge at Blacon as described in this article. The maximum height of this load was 13 ft. 8 in. above rail level, and its width, 11 ft. 6 in., exceeded the loading gauge by 2 ft.

In order to make the journey from Darlington in safety it was necessary to re-arrange entirely the existing goods service during the usual Sunday morning quiet period and to restrict the speed of the special train to five miles per hour. Even these precautions were not sufficient for, owing to the overhang, it was necessary on two occasions to re-adjust the position of one of the castings, and at one point to remove a signal post in order to obtain room to pass.

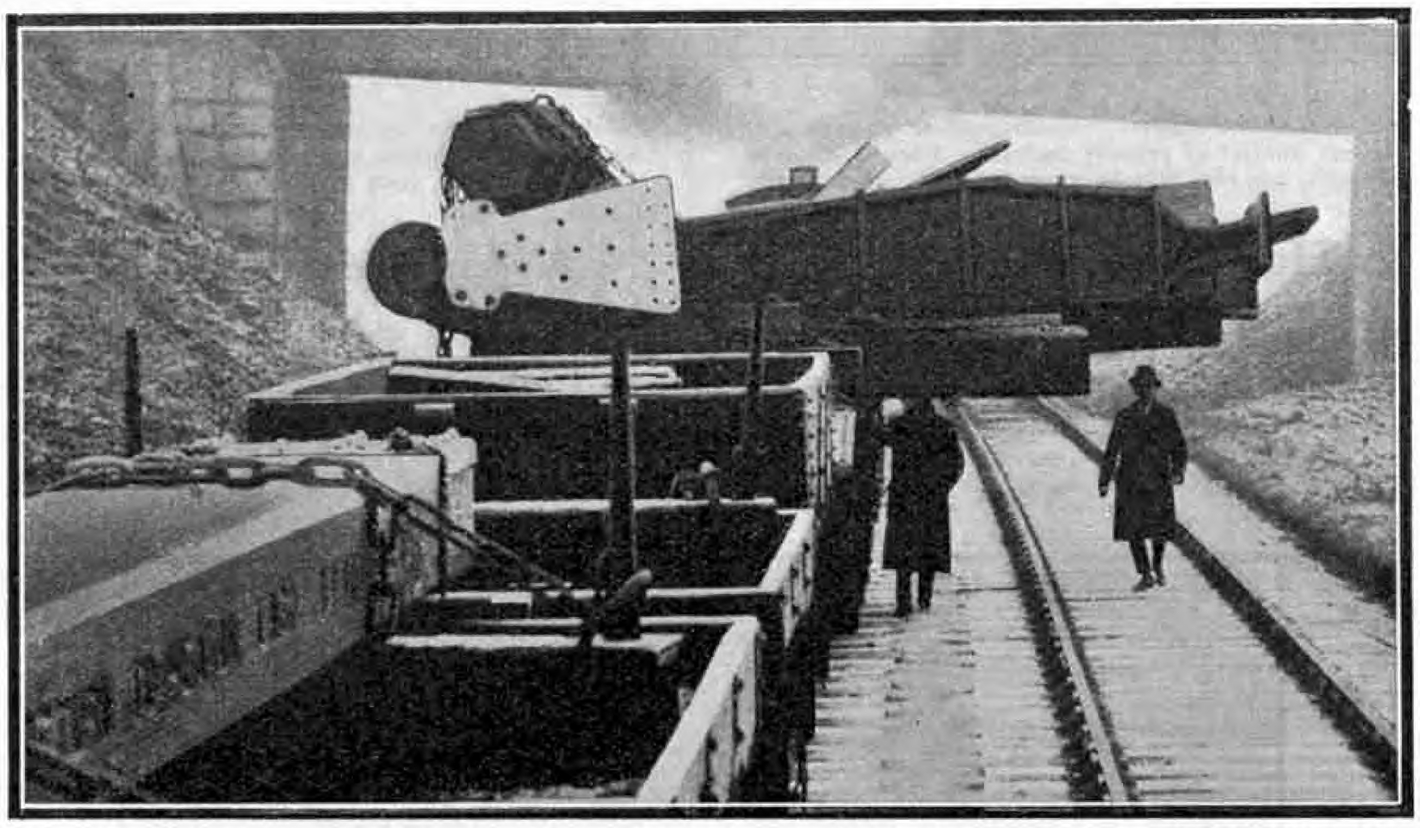
Another interesting feat of transport was carried out some time ago between Trafford Park sidings at Manchester, and Birkenhead. In this case the load was an 87-ton stator built by the Metropolitan-Vickers Electrical Co. Ltd., for shipment to Japan. This huge stator was 11 ft. 6 in. in width, 12 ft. 4 in. in length and 10 ft. in height. When loaded on the railway truck it stood 13 ft. 8 in. in height and in width was 2 ft. in excess of the loading gauge. Its transport involved a special train and the clearing of both lines for it over the entire distance.

The consideration of the route to be followed occupied some six months, and it was then arranged that this should be Trafford Park, Northwich, Mouldsworth, Chester, Birkenhead. A start was made one Sunday morning and the first trouble was a little argument with the awnings over the platform at Old Trafford Station. This was not serious, however, and in due course the train arrived at Helsby. It was then found that the load slightly exceeded the dimensions originally given, and considerable delay occurred. This delay was serious, because special arrangements had been made for transporting the vehicle to the steamer as soon as the train arrived. Various suggestions were made, and

it was arranged that the Metropolitan-Vickers traffic agent should meet certain railway officials next morning to decide upon the best course of action. The officials duly arrived at the spot, but the vehicle was nowhere to be seen !

Subsequently it was ascertained that a Cheshire Lines official had diverted the load to another route in the hope of getting it through quicker. Various difficulties were encountered on this new route, especially in regard to the bridges, which were barely large enough to allow the vehicle to pass. In one tunnel near Blacon it was actually necessary to take away the ballast and move the rails inward in order to get the load through ! This was the last serious difficulty, however, and slowly but surely the train proceeded to its destination with nothing worse than the scraping of a few telegraph poles.

Occasionally special trains are arranged to handle certain traffic, not because the dimensions of the loads exceed the standard loading gauge, but owing to the exceptional weight of the traffic. One of the most interesting cases of a load of this type was a unique consignment of three 16-in. guns that had been built by Sir W. G. Armstrong Whitworth & Co. Ltd., at Elswick for the great super-dreadnought, H.M.S. "*Rodney*," which at the time was under construction at Cammell, Laird & Co.'s Birkenhead yard.



The stern frame of the "*Olympic*" on the way from Darlington to Middlesbrough. The enormous overhang of this frame made it necessary to attach a 30-ton balance weight to the opposite end in order to keep it in position.

The task of moving these guns was entrusted to the L.N.E.R., and a special train was made up, consisting of a 4–6–0 locomotive No. 932, two brake vans, six ordinary wagons, and three special sets of three trolley wagons each. Each of the guns was 62 ft. in length and weighed 105 tons, and the total length of the train with the guns mounted one on each set of trolley wagons was 143 yds. During the early part of the run from Elswick to Birkenhead the train's speed was restricted to 20 m.p.h., but later this was increased to 25 m.p.h.

Another interesting consignment was hauled recently by the L.M.S.R., when three locomotives supplied by Beyer, Peacock & Co. Ltd., of Gorton, Manchester, were conveyed from that company's sidings to the Alexandra Dock, Liverpool, for shipment. The engines were conveyed in sections, the larger pieces of which consisted of three engine frames weighing 48 tons, three tenders weighing 42 tons, and three boilers weighing 60 tons. When this consignment was loaded centrally and secured on suitable vehicles, the engine frames were 1 ft. 11 in. outside the ordinary gauge limits, and the tenders 1 ft. beyond the ordinary gauge limits. This excessive width of load necessitated working by special train with the opposite line blocked in sections. The total consignment weighed in all 320 tons.

It will be easily understood that the staff engaged in this branch of railway work must be specially trained and must possess a peculiarly intimate knowledge of their company's lines.

What Shall I Be ?—(*Continued from page 415*)

county, city and borough police forces of Great Britain. Other important forces are maintained by the railway companies and dock authorities, the chief of which is the Port of London Authority. The men belonging to these forces have the task of guarding the premises controlled by their employers, and they are organised on similar lines to ordinary police. Full information in regard to the necessary qualifications and the addresses to which applications should be made may be obtained from the guides published by the special journals devoted to police matters, or from the Editor of the "*M.M.*"

The position in Ireland is that there are two forces to which admission may be sought. These are the Civic Guard, the police force of the Irish Free State, and the Royal Ulster Constabulary, the corresponding force in Northern Ireland. These may be regarded as the successors of the former Royal Irish Constabulary. The regulations for admission to them are similar to those applying in Great Britain, and the conditions of service also resemble those in the forces with which we have already dealt. The rates of pay, allowance and pension in the Royal Ulster Constabulary are the same as in Great Britain. The members of the Civic Guard receive slightly lower pay.

It should be noted that recruiting for the Irish Police Forces is practically confined to the countries covered. The Royal Ulster Constabulary considers applications from candidates outside Ireland, but these must have been born in Ulster. The Constabulary is comparatively small, and as a result there is a long waiting list.

A word may be said here in regard to police forces overseas. These may be divided into three groups, the first consisting of those administered by the Colonial Office, the second the Indian and Burmese Police, and the third including the forces in the self-governing Dominions. As far as the Dominions are concerned, vacancies in the various police forces are filled by men residing in them, and in no case can applications from this country receive consideration. Rates of pay and conditions of service in these forces usually are similar to those obtaining in Great Britain, due allowance being made for differences in cost of living, and readers who are qualified for admission to them may obtain the necessary information by applying to the head of the force in which they are interested.

A certain amount of recruiting takes place in this country for the Indian and Burmese Police and for the forces controlled by the Colonial Office. Generally speaking, the appointments granted are in the commissioned ranks, and a high educational standard is required from applicants, while in certain cases qualifications of a military character are looked for. Admission to the Indian and Burmese Police is by competitive examination, and certain other qualifications are required. Full information in regard to colonial appointments may be obtained from the Director of Recruitment (Colonial Services), Colonial Office, 2, Richmond Terrace, Whitehall, London, S.W.1 ; and for details of Indian and Burmese appointments application should be made to the Secretary, Service and General Department, India Office, London, S.W.1. Vacancies are not very frequent, particularly at the present time.

Roadless Transport—(*Continued from page 411*)

members of the expedition were divided into four groups, each of which was to explore a separate route to the African coast of the Indian Ocean. The group led by M. Haardt set out for Mozambique, the chief seaport of Portuguese East Africa, travelling down the west coast of Lake Nyasa and through Portuguese territory. The port was reached after eight months of struggle through swamps and jungles, and across swollen rivers, and from there they sailed to Madagascar, where the four groups of the expedition eventually re-united before returning home.

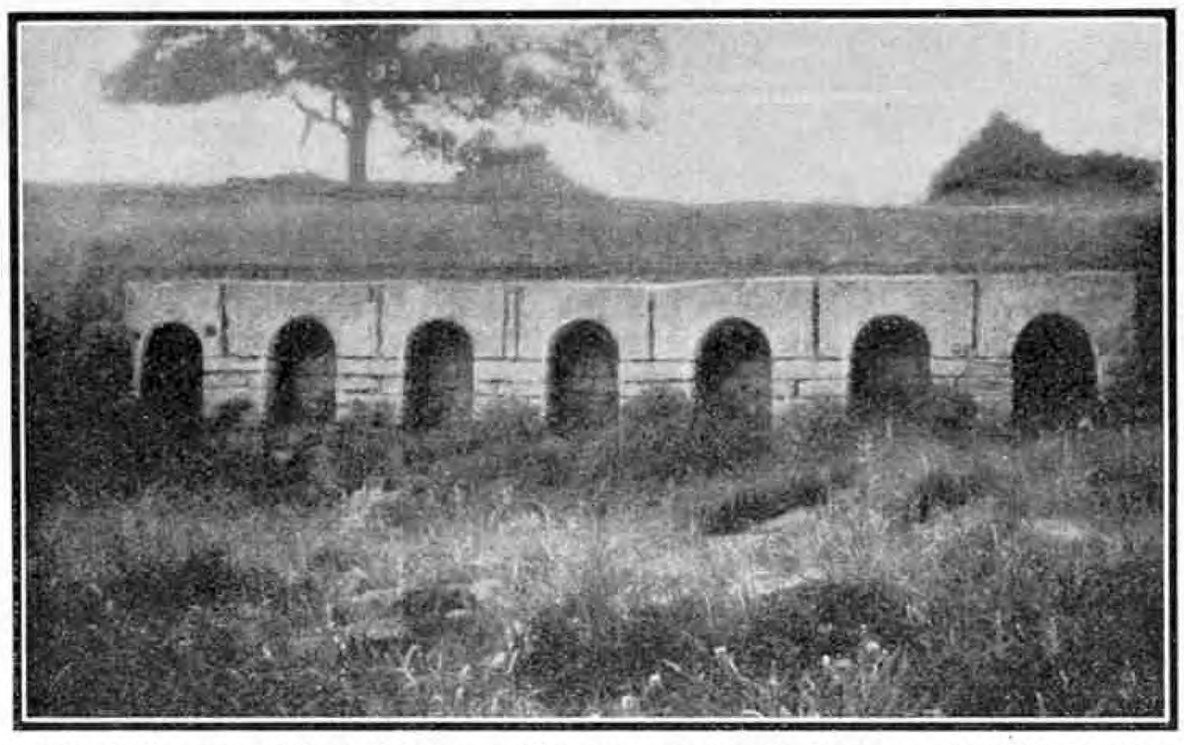
We have mentioned that creeper track vehicles have been used successfully for transport service over steep snow-covered ground. For instance, a Citroën Kegresse vehicle ascended the snow-covered passes to the St. Bernard Monastery, Switzerland. The vehicle that accomplished this feat was equipped with long wide creeper tracks, a special undershield protecting the engine and transmission from snow, and skis were fitted under the front wheels. The Monastery stands at a height of 8,100 ft. above sea level, and before this ascent was only accessible to ski-runners during eight months of the year. The creeper track vehicle first climbed Mt. Montets, 4,600 ft. in height, and then Mt. Forclay, 1,000 ft. higher. Finally, it negotiated the severe gradients, covered with deep drift snow, from the Cantine to the Monastery itself. The vehicle accomplished the difficult climb without faltering, and its success afforded striking proof of the utility of creeper track vehicles as a means of maintaining communication throughout the year with places hitherto isolated by deep snow for many months at a time.

FROM OUR READERS

These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

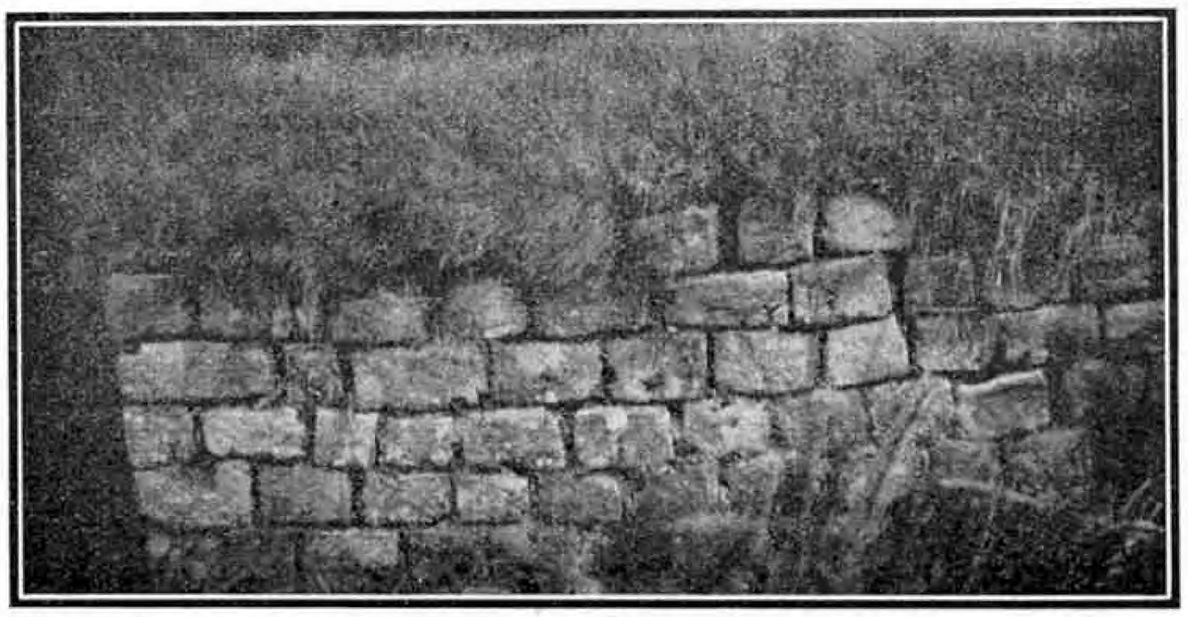
A Visit to Hadrian's Wall

During an enjoyable holiday spent at Hexham I saw several of the most interesting sections of the wall built by the Romans from Wallsend to the Solway Firth. The wall was 73½ miles in length and forts known as "mile-castles" were erected on it at intervals of a Roman mile, or about seven furlongs. There were two turrets between each pair of mile-castles, and at distances varying from three to eight miles apart were forts capable of accommodating large garrisons. A flat-bottomed ditch known as the vallum was excavated on the south side of the wall, and on the north was a second ditch of V-shaped section. The wall is supposed to have been built about 120 A.D. by the Emperor Hadrian, and there are traces of an earlier earthen rampart constructed by Agricola.



Arches in the ruins of the bath house at Cilurnum, a fort on the Roman wall built by Hadrian.

I visited the two great forts known as Cilurnum and Borcovicus. The first-named of these is on the right bank of the North Tyne, a river that was bridged by the wall, and when visiting it I was greatly interested in the remains of the bath-house, where I saw the hypocaust, or chamber through which hot air circulated in order to warm the floor of the building, which was raised on pillars. I also inspected the underground strong room of the fortress and secured a photograph of the entrance.



The remains of a fort at Cilurnum. The two photographs on this page were taken by our reader, F. E. Wilson, West Hartlepool.

Beyond Cilurnum the wall climbs to the bleak moorlands, where it runs for miles along the top of the crags. The fort of Borcovicus is at Housesteads, in this wild and practically uninhabited section of the country, and its buildings therefore are to-day more nearly complete than those erected in more populated areas. On the moors it is possible to walk along the top of the walls for miles without a break and I did so for a considerable distance westward towards the place where it begins to descend to the Lowlands on its way to Burgh-on-Sands on the Solway.

F. E. WILSON (West Hartlepool).

A Journey from Lake Nyasa to Beira

The first stage of our long journey from Nyasaland to England began about 10 o'clock one morning, when we left Fort Johnstone, at the southern tip of Lake Nyasa, in a motor car. The road to Zomba, our first halting place, is little better in places than a cart track until the mountains south of the Lake are reached, but there it winds in and out in beautiful surroundings. Zomba is the headquarters of the Nyasaland Government, and is on the slopes of Mount Zomba.

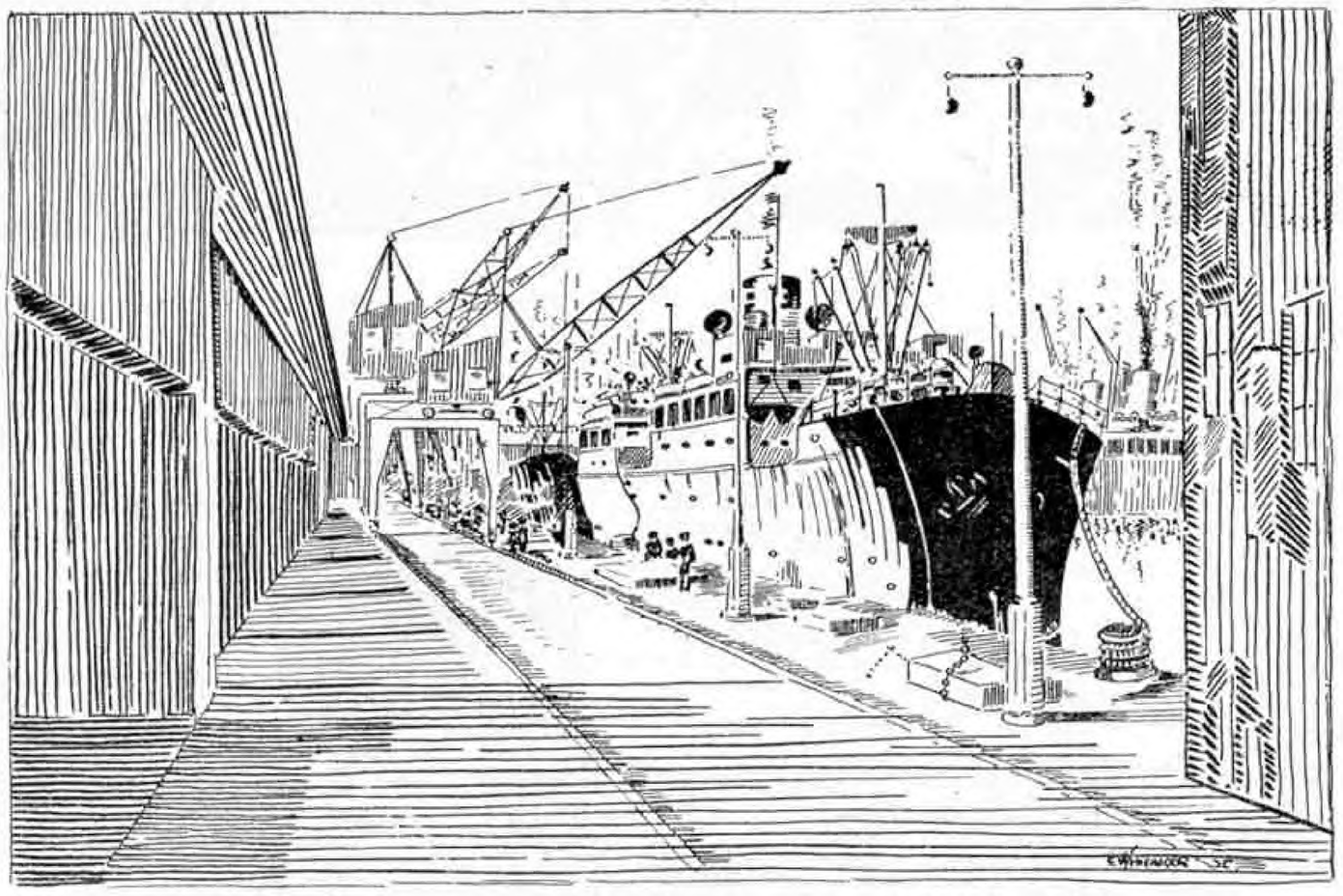
Next day we travelled on to Blantyre, the railway terminus, making the journey in a mail van, for this was the only vehicle available. The mail bags did not form very comfortable seats! Then followed a slow and tiring railway journey through the jungle, the monotony being broken only when the train ran along the banks of the Shire River, which drains Lake Nyasa. Finally we reached Port Herald, where our luggage was examined by customs officers, for we were now entering Portuguese East Africa; and at 7.30 in the evening we reached Morassa on the Zambesi River, after having been in the train since 6 o'clock that morning.

The next stage in our journey was a night trip on the Zambesi in a steamer. We had dinner on the boat, but the insects that dropped into the food from the lamps above prevented me from enjoying it. Early next morning we arrived at the railhead south of the great river, and there we took the train for Beira. This portion of the journey also was wearisome and the only excitement that we had came when our train was cheered by crowds of excited natives. I noted that the sleepers on the track are made of steel, the reason being that ants would destroy those made of wood. When we arrived at Beira we had been travelling for a week and were glad to take up our berths on the roomy and comfortable "*Landaff Castle.*"

W. URQUHART (West Worthing).

With a Sketch Book at the Docks

During the past year I have visited many of the largest and busiest dock systems in Europe, including those at London, Belfast, Manchester, Antwerp and Dieppe, and the accompanying sketch is based on impressions gained during these visits. It is intended to illustrate those features of a large dock system that a Meccano boy finds most interesting, for it shows the gigantic liners and cargo boats, and the immense cranes that, together with high speed ship coalers, elevators and conveyors also seen near docks, form an almost inexhaustible store of subjects for model-building. I find a visit to the docks very useful when I am in search of suggestions for new Meccano models, or for further schemes of operation on a Hornby layout. A sketch book must be used, of course, but I find that the task of noting down the chief features of an attractive crane or some other piece of machinery adds a thrill to my visit. E. WHITTAKER (Leeds).



A typical dock scene, a splendid drawing by our reader, E. Whittaker, Leeds.

Among the Indians of British Columbia

The Indians living near Hazelton, in the north of British Columbia, have retained more of their native customs and style of dress than those of their race who have been more closely associated with white men. The photograph on this page shows a group of four chiefs and medicine men who took part in a pageant held in 1928 at Fort St. James, by the Hudson's Bay Company, to celebrate the centenary of an official visit to the Fort by Sir George Simpson. Sir George was Governor of the Company about a century ago, and his visit helped to secure that part of the country for the British Empire. Indian sports and games, including war dances and speeches, were a special feature of the centenary celebrations.



Four chiefs and medicine men of the Chilkat Indians, a tribe of British Columbia They are wearing the ceremonial Indian dress and our photograph was taken by our contributor, R. Watson, Manitoba, Canada.

The chiefs in the centre of the group are wearing the ceremonial blankets or robes of the Chilkat Indians. These blankets are made of the white wool of the mountain goat, coloured yellow, black or greenish blue with native dyes. Red cedar bark and sinews of caribou or whale are interwoven with their threads and their sides and lower edges are heavily fringed. The designs on them are purely native in origin and are totemic in character, representing the animals, fish or birds that are the personal totems of the wearers. Great care is taken in weaving the blankets, a year's work being necessary to complete a single robe. The wool is dyed after it is spun, and for each colour used the wearer fasts a day in order to ensure uniformity in shade.

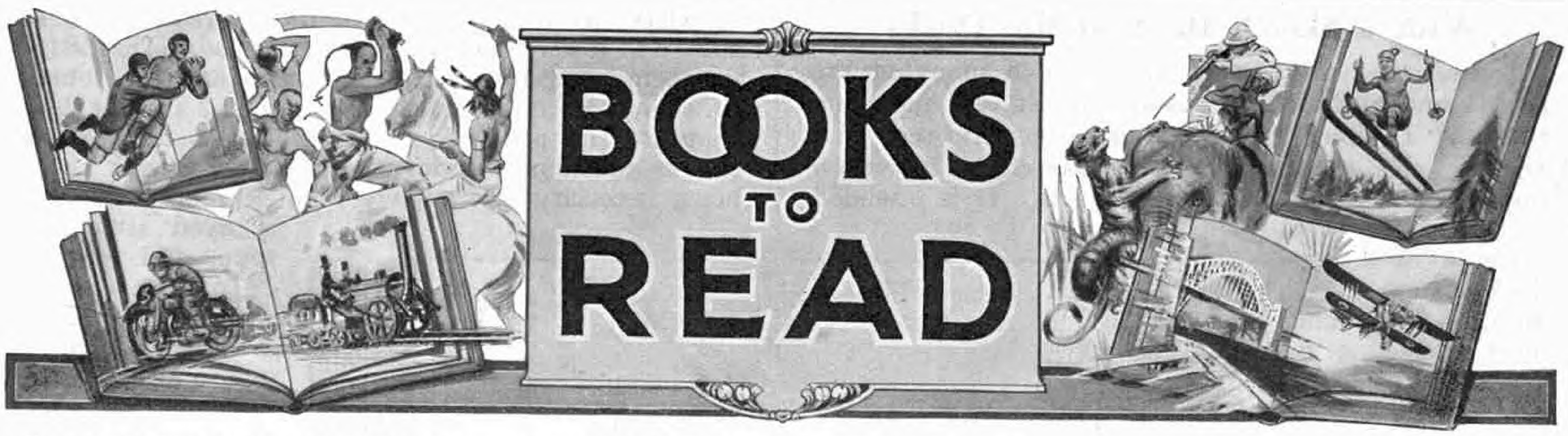
The Indian shown on the left of the accompanying photograph is wearing a dress famous throughout the district as the "Costume of a Thousand Thimbles," because of the number of sewing thimbles with which it is decorated. These have been carefully collected in order to adorn his coat, and they jingle in an extraordinary manner when he dances to the beat of a drum. They even tinkle as he breathes! R. WATSON (Manitoba, Canada).

A Strange Pet

When we first saw our cassowary he was no larger than a full-sized rooster. He hailed from New Guinea, and had been given to my father by the captain of a ship that plied between the island and Australia. We kept him in our compound in the East Indies. He soon became tame and was allowed to roam about at will, although he very seldom wandered out of the compound. When he did we usually found him surrounded by curious natives, who were surprised to find a bird that could not fly.

I do not know if all cassowaries have occasional fits of insanity, but our bird certainly did, and then he would dash furiously through the compound, kicking everything that came in sight. He leaped on top of a cylindrical basket when in one of these fits. Naturally it rolled from under him, and it was a very bewildered-looking cassowary that rose to his feet.

The bird was not very intelligent. Whenever a daring chicken stole a beakful of his rice, he chased it round the compound. This was always a splendid opportunity for the other chickens, who promptly demolished the rest of his dinner! K. KELLAR (Glasgow).



Here we review books of interest and of use to readers of the "M.M." We can supply copies of these books to readers who cannot obtain them through the usual channels. Order from Book Dept., Meccano Limited, Old Swan, Liverpool, adding 1/– for postage to the price. Postages on different books vary, but any balance remaining will be refunded.

"The History of Everyday Things in England," 1066–1499

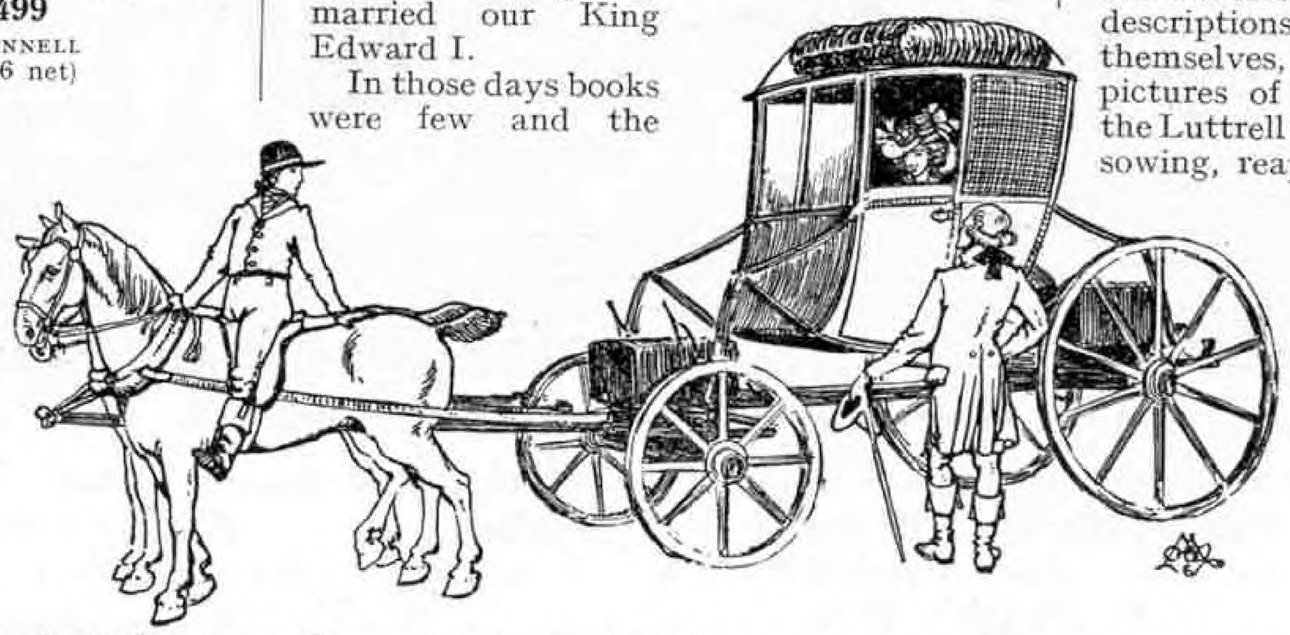
By M. and C. H. B. QUENNELL
(B. T. Batsford Ltd. 8/6 net)

This interesting volume gives us the history of England from the time of the Norman Conquest to the end of the Middle Ages, but instead of dealing chiefly with the lives of kings and accounts of their wars, as most history books do, the authors tell us the story of the people themselves. They picture for us our forefathers at work and at play, and the many excellent illustrations help to make their account a very interesting one indeed.

The volume is divided into four parts, each dealing with a period of a century, and we are able to follow the changes that took place in warfare, trade and commerce, agriculture, building, and in many other important aspects of everyday life. In the first chapter, we see the castles built by William the Conqueror and his Norman barons to overawe the conquered Saxons, and we learn how their occupants lived in them. Life was then very crude, for only the very rich and powerful had private rooms and the majority of the inhabitants of the castles lived in the hall, the floor of which was strewn with rushes. From the castles we turn to the monasteries, then the great centres of civilising influences, and the influence of the monks on agriculture is made clear. We see how the common people lived; how the land was ploughed, sown and reaped; how cooking was done; and how the monks themselves passed their time; and we are even given pictures showing how such a homely occupation as hair-cutting was practised 800 years ago.

The chapter dealing with the 13th century is planned on similar lines, and traces the many interesting developments that followed. The strong but simple castles of William the Conqueror's time were succeeded by the magnificent fortresses at Caernarvon, Conway, and Harlech. It is interesting to find that life in a country manor house of the 13th century was much more attractive than in the ruder houses of earlier times. Carpets had replaced the rushes of the previous century. It is interesting to read of Spanish ambassadors who visited this country during the reign of Henry III that "the walls of their lodgings in the Temple were hung with silk and tapestry and the very floors covered with costly carpets." Even baths had been introduced by this time, the credit for this momentous step being thought to be due to Eleanor of Castile, the Spanish lady who married our King Edward I.

In those days books were few and the coming of strolling players, minstrels and jugglers formed an agreeable break in the monotony of hours spent by the men in mending their bows, or sharpening other weapons, and by ladies in needlework.



A post chaise as used by our ancestors for posting from town to town. There was no driver for these vehicles, which were driven by a postilion. The horses were hired from posting houses along the road. From "Everyday Things in England," reviewed on this page.



The author of "Tinker, Tailor—" (reviewed on this page) in winter kit at Regina, Canada.

Dancing and a game that was the forerunner of blindman's buff were very popular, but tournaments were the chief amusement of the men. A chronicler says that "the young bachelors pass their time with sham fights and other exercises, also in cock-fighting, bear- or bull-baiting, wrestling and other sports."

The next century was that of the Black Prince and the Battle of Crecy. The knights who took part in the French wars and their brave deeds are dealt with, but the authors devote most of their space to descriptions of the daily life of the people themselves, and we have some attractive pictures of country life reproduced from the Luttrell Psalter. These show ploughing, sowing, reaping and threshing operations, and even the small boy slinging stones at the birds in order to prevent them from stealing the seed is not forgotten.

The remaining chapter is devoted to the 15th century, when the Middle Ages were coming to an end. At the beginning of the century came Agincourt, and later the Wars of the Roses nearly destroyed the nobles, but the life of the common people went on throughout the period of these great struggles, and trade and commerce flourished. Striking developments took place in connection with learning and libraries began to be formed even before the development of printing. The monks then actually made books as well as read them, and as these were very valuable, they often bore quaint warnings and entreaties to the reader, such as "Wash! lest touch of dirty finger On my spotless pages linger." Some of these warnings were in the form of curses on those who stole or destroyed a book, and it is pointed out that "when a boy nowadays writes in his book that no one is to purloin it under various fears, he is only doing what the mediæval monk did before him."

It is impossible in a short review to mention all the wonderful things dealt with in this interesting volume, which is one that may be read with pleasure and profit by all who wish to know how their ancestors in these islands lived and worked. The illustrations include many half-tone plates in addition to full-page drawings and sketches in the text, and there is also a coloured frontispiece.

"Tinker, Tailor—"

By "GREENHORN." (The Bodley Head, 8/6)

This account of a journey round the world for a wager is written by an adventurous young man who hides his identity under the pen-name of "Greenhorn." After having run away from school, the author served in France, when a severe nervous breakdown made it seem likely that he would "go to pieces" altogether. In order to save him, a friend laid him a considerable wager that he would not work

his passage round the world in five years without accepting any money whatever from home. "Greenhorn" accepted the challenge and won through, but what was of greater importance was that in the process his health and mental stability were restored. The story of his five years of adventure makes interesting reading. We are with him in all kinds of jobs and places from lumber camps to mines; in sailing ships and tramps; assisting a sheep farmer in Australia; as a plate boy in a third-class liner; and as a steward in an emigrant ship.

On his first job (in New York, as a newspaper canvasser), he made only about enough to pay for his shoe leather. It was whilst walking down Broadway that he saw a notice "Hands Wanted," and, having been taken on, commenced unpacking spools of thread as hard as he could go. "I never knew quite why I had to unpack them, because a minute later they were snatched up by another man and repacked! I was simply a cog in a vast machine of which I understood the purpose not at all. However, they paid me twelve dollars a week for being a cog in their machine, a sum on which I could just, but barely, exist."

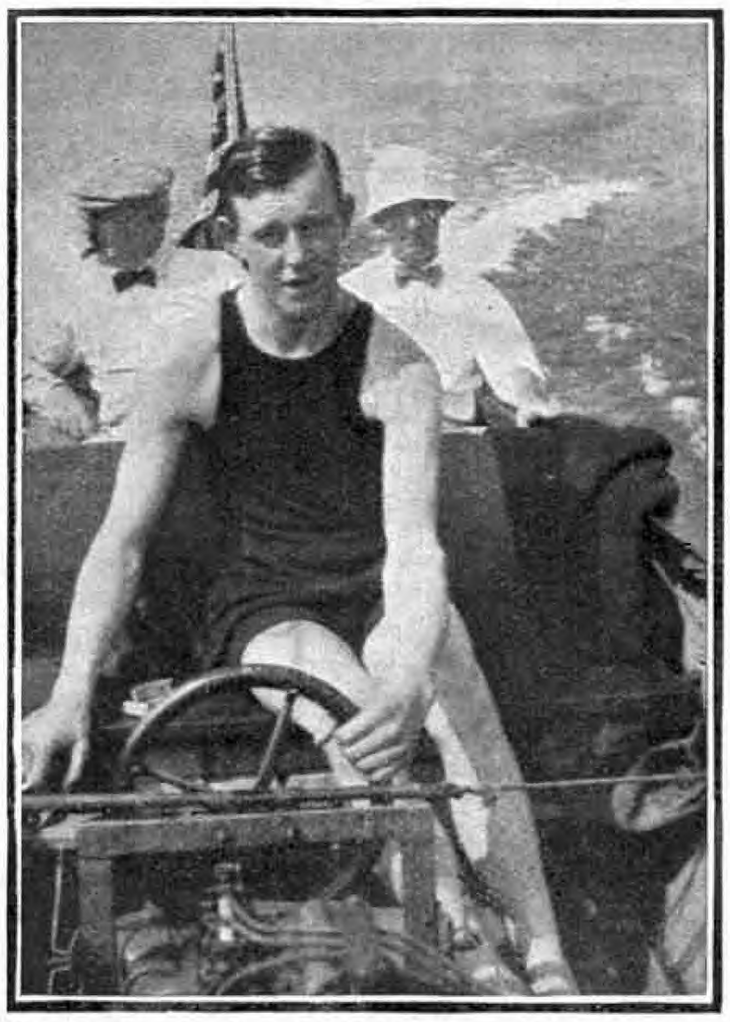
From New York he went to the woods as a lumber jack, where he was often in danger from exposure. "One day in late winter I was told off to help Pete collect an extra-heavy load of provisions. We spent the night at the store. Very early next morning, with angry black clouds above, we started our journey back. Eventually it became a blizzard and impossible to travel, and the dogs and ourselves all huddled down by the sled and waited for it to pass. After the blizzard came such a frost as I had never known—fifty below it seemed to go, and then down again below that. The going was terrible and presently we stopped to rest; as I turned to Pete he bellowed at me, 'Bill, your face is frozen—get some snow on it—quick!' At the same moment I caught sight of his face and saw that one side of it was a queer dirty grey-white. 'And so's yours,' I shouted back, as I flung myself down in the snow and rubbed my face with it till some sort of circulation came painfully back. We started off again, but we were still four hours from camp and in half an hour our faces were just as bad as ever, and my left hand and arm had begun to go too. From then on it was a continual struggle to get some circulation going and then to travel as far as we could before it stopped again. Anyone who has had a touch of frostbite knows the pain of returning feeling—well, that was our guide; directly the pain ceased we knew we had to stop and rub ourselves with snow. At last, just before dusk, after what seemed like weeks of nightmare travel, we got back to camp. The cold had been so great that the men had refused to continue work and had all come in from the woods early in the day. Anyhow, they worked hard enough on us getting our circulation back, and when it finally came the stinging and biting was almost unendurable."

From lumbering "Greenhorn" went south to the oil fields; then, after some fun on a horse ranch, northwards again, to work the harvest. After a spell in Canada, where he joined the Royal North West Mounted Police, he shipped before the mast in a windjammer to the South Sea Islands, where after prospecting for gold, he was down and very nearly out. However, he managed to get to Australia, and from a job on a sheep station he saved sufficient to enable him to pay his passage to New Guinea, whence he worked his passage to South Africa, back again to Australia, and finally home to England.



The author of "Tinker, Tailor—" with friends on the shore of a lake in Australia (see below).

"On a beautiful summer dawn, the cliffs of England hove sparkling into the early sunshine, while I stood on the fo'c'sle head and saw them, and then couldn't see them, because something seemed to have gone wrong with my eyes! Five years, all but a day, I should have been away! Five years that had given me physical health and strength, and a good grounding in how to bear with the 'clutch of circumstance.' But what was I coming back to? For a moment, in spite of the extraordinary pull I felt towards England herself—her earth and grass and trees, a physical longing for her meadows full of buttercups, and for the long, humped, brown shoulders of her moors—I was sorry the five years were over."



Out in a motor-boat at New York. From "Tinker, Tailor—" reviewed on the previous page.

"I was coming back to my own country, to my own people," he continues. "For the pure fact of that coming back from strange to homely things, if for no other reason, the wager had been worth while."

"Wagon Details and Construction"

By P. H. Saunders, A.M.I.Loco.E., M.I.E.I. (Crosby, Lockwood & Son. 7/6 net)

A railway wagon at first sight seems to be a very ordinary and utilitarian piece of work, but careful examination of even the common coal truck reveals much of interest to the railway enthusiast. This is particularly the case now that all-steel wagons are rapidly coming into more general use. "*Wagon Details and Construction*," therefore, is likely to be an acceptable book not only to those connected with this branch of engineering but also to those who, though not professionally concerned with the industry, are yet keenly interested in its many phases.

The author writes as a result of practical experience in his subject both in this country and in Germany, and he deals with it in a very comprehensive manner. The manufacture of steel wagons, the various processes involved from the bare frames to the finishing and, in the case of wagons for abroad, packing for export, are well described. Special attention is given to the different presses and forging machines used for the forming of the various parts of the structure, and the probability of welding superseding riveting is hinted at. It is interesting to learn that reconditioning of worn tyres can be carried out by the deposition, by welding, of sufficient metal on to the tyres to allow them to be finished up satisfactorily. Much useful information regarding axle-boxes and bearings generally is included, while springs and the interesting machinery for their manufacture are not neglected. The care to be taken in painting, particularly in dealing with steel wagons, and the advantages of modern methods of spraying are pointed out by the author, who rounds off the book by giving a classified list of materials specified for various parts.

The book is well illustrated by photographs and drawings, and its general style is well up to the usual standard of "Lockwood's Manuals."

Interesting New Books

The undermentioned books, recently published, will be reviewed in a future issue.

THE INDIAN OCEAN
by Stanley Rogers. (Harrap, 7/6)

SEVENTY FATHOMS DEEP
by David Scott. (Faber & Faber, 12/6)

THE ROMANCE OF SPEED
by P. M. Henshaw. (Gale & Polden, 1/6)

RAILWAY LITERATURE 1556–1830
by R. A. Peddie. (Grafton, 10/6)

CINE-PHOTOGRAPHY
by J. H. Reyner. (Chapman & Hall, 10/6)

WATCHINGS AMONG BIRDS
by H. A. Gilbert. (Arrowsmith, 10/6)

WONDERS OF THE SKY
by Miss Mary Proctor. (Fredk. Warne, 6d.)

THE SEA GHOULS
by E. F. Spanner. (Sampson Low, 7/6)

FISHERMAN AND FISHING WAYS
by Peter F. Anson. (Harrap, 7/6)

SEA-DOGS OF TO-DAY
by Alan J. Villiers. (Harrap, 7/6)

STAMP COLLECTING
by Stanley Phillips. (Sampson Low, 6/–)

WIRE SPLICING
by R. Scot Skirving. (Brown, Son & Ferguson, 2/–)

PLANTS: WHAT THEY ARE AND WHAT THEY DO
by A. C. Seward. (Cambridge University Press, 4/6)

RESULTS OF INTERNATIONAL MODEL-BUILDING COMPETITION

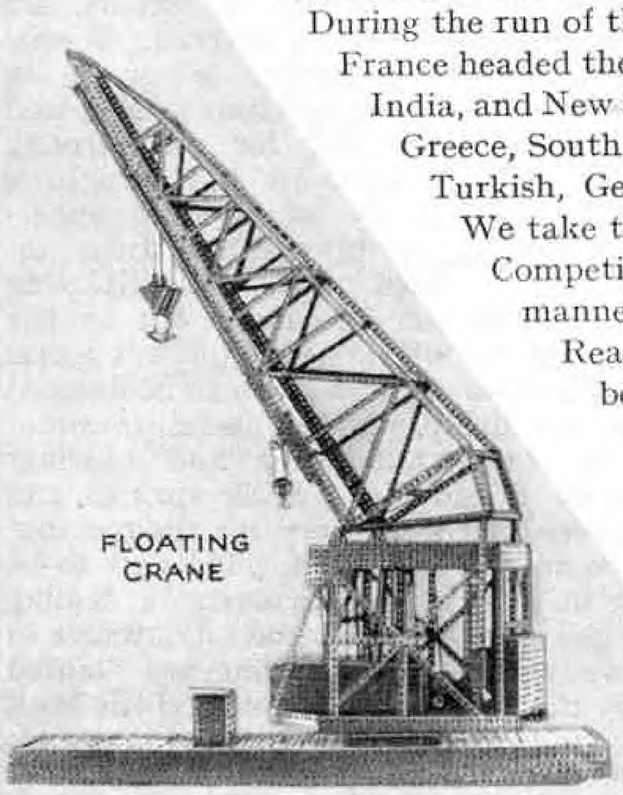
£500 IN PRIZES

Thousands of Meccano model-builders all over the world have been waiting for the results of the £500 Model-building Contest. The Contest closed for entries on the 31st March, and since that date the judges have been hard at work on the huge number of entries. No one who has not had the experience can have any idea of the enormous amount of work involved in handling a competition of this kind, for each entry has to be very carefully scrutinised and often re-examined several times before a final judgment on its merits can be reached. During the run of the Contest every post brought entries from all parts of the world. England and France headed the list with the greatest number of entries, but Italy, Holland, Australia, Canada, India, and New Zealand were close runners up. Many good models came from China, Finland, Greece, South Africa, Spain, Argentine, Mexico, Sweden, Belgium, Norway and Denmark. Turkish, German and Egyptian model-builders also took part in the Contest.

We take this opportunity of extending our thanks for the splendid support the Competition has received from Meccano boys of all nations, and for the fine manner in which they have all helped to make the event such a great success.

Readers will be glad to know that some of the best models will be described and illustrated in a splendid book, details of which are given in the circle below. This book will be of special interest to all model-builders whether prize-winners in this Contest or not, for they will want to construct these splendid models for themselves.

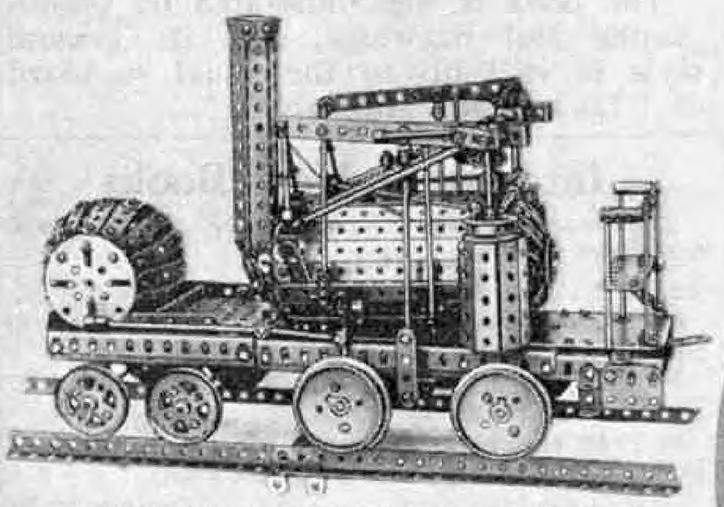
The names and addresses of all the principal prize-winners in the Competition are announced on the three following pages.



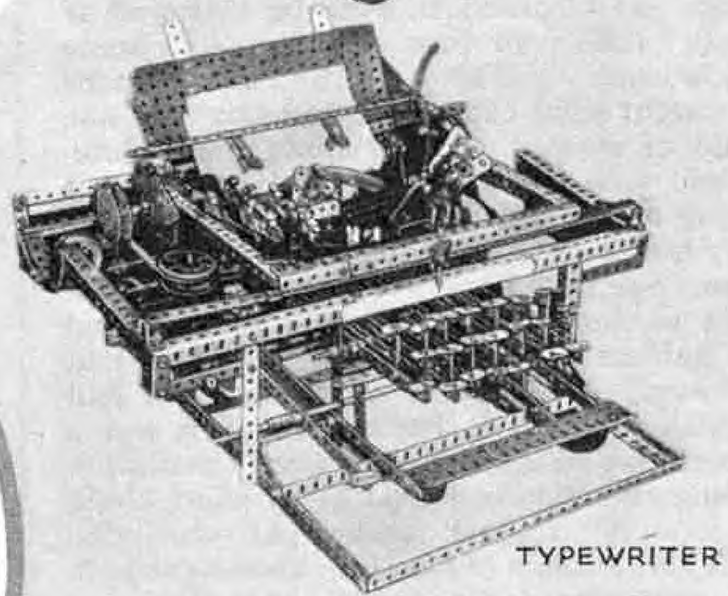
FLOATING CRANE



ELEVATOR



"PUFFING BILLY" LOCOMOTIVE



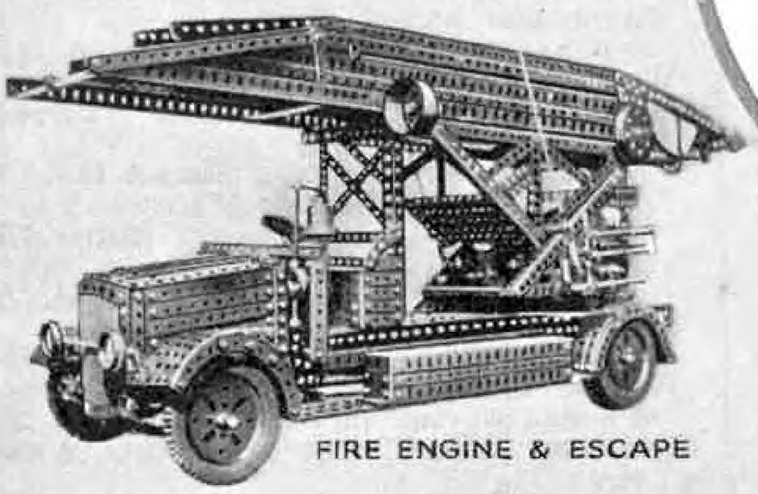
TYPEWRITER

The 1932 "Book of Prize Models"

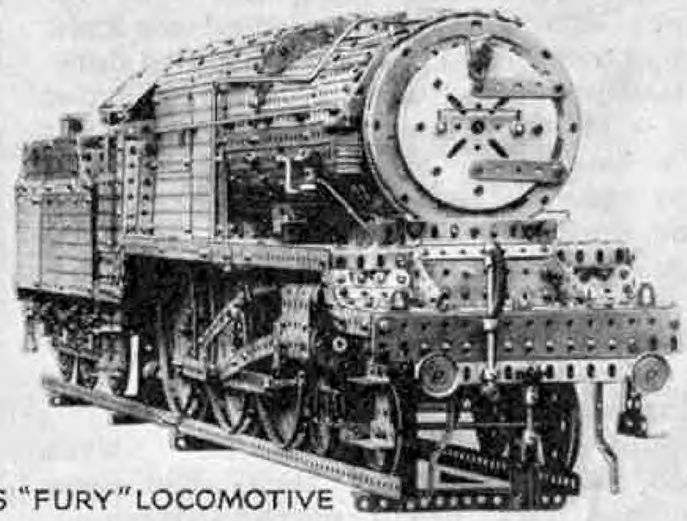
This splendid book will be published on the 25th June. It may be ordered from any Meccano dealer, price 9d., or direct from Meccano Ltd., price 10½d. post free. Orders will not be acknowledged but will be dealt with in strict rotation as soon as the book is published.

The Overseas prices from dealers will be as follows: Australia, 1/9; New Zealand and South Africa, 1/-; Canada, 25 cents.

Readers living in countries other than those mentioned should order from Meccano Ltd. Old Swan, Liverpool, sending a remittance of 1/2 with their orders.



FIRE ENGINE & ESCAPE



L·M·S "FURY" LOCOMOTIVE

SECTION "A"

(*Competitors over 18 on 31 March, 1932*)

Five First Prizes of Cheques for £6.6s.

Anglada, J., Barcelona (Electric Passenger Lift).
Bulot, A., Calais, France (Dragline).
Lewis, E. G., Cheltenham, Glos. (Sewing Machine).
de Proft, J., Willebroeck, Belgium (Lifting Bridge).
Willems, J., Hoboken, Belgium (Cranes, etc.).

Five Second Prizes of Cheques for £4.4s.

Cameron, K. W., Claughton, Ches. (L.M.S. Loco).
Caton, W., Liverpool (Ferry Boat).
Holmes, A., Manchester ("*Puffing Billy*" Locomotive).
Hoyaux, P., Antwerp (Marine Steam Engine).
Ringnalda, J., Leeuwarden, Holland (Locomotive).

15 Third Prizes of Cheques for £2.2s.

Boulton, W., Bolton (Sectional Model of a Coal Mine).
Brown, C., Edinburgh (Fire Engine).
Bull, K., Oslo (Crane).
Burgh, P. v. d., Dordrecht, Holland (Motor Tractor).
Carpenter, G., Kimpese, S. Africa (Dividing Engine).
Coates, J., Toronto (Breakdown Crane).
Dommelen. K, v., Antwerp (Antwerp Cathedral).
Escreet, P., Durban (Articulated Locomotive).
Jukes, R., Christchurch, New Zealand (Churn).
Maitland, H., London, W.14 (Aeroplane).
Matthews, J., Fillongley, Nr. Coventry (Saloon Car).
Robson, T., Amman, Transjordania (Armoured Car).
Sauvin, F., Geneva (Telpher).
Vecchini, W., Ancona, Italy (Aerodrome, Aeroplanes).
Walker, T., Quebec (L.M.S. Transformer Trolley).

The following competitors share Meccano and Hornby Train goods of a total value of £60

A. Adams, Durban (Crane); W. Albert, Calais (Roundabout and Revolving Aeroplanes); J. Bakker, Hilversum ("Penny-in-the-Slot" Automatic Machine); P. Banks, Dunstable, Beds. (Floating Crane); G. Baracco, Torino (Orrery); C. Bardenfleth, Ruysted Kyst, Sjcelland, Denmark (Wind Motor); N. Batchelor, Westcliff-on-Sea (Crane); F. Beard, Bournemouth (Four Masted Barque); J. Beardsley, Chesterfield (Battle Cruiser); A. Beck, Rotterdam (Aeroplane); P. Begemann, Semarang, Java (Self-Recording Water Level Gauge); E. Bodenhagen, Copenhagen (Electric Sign); Josè Luis Bribiesca, Mexico, Republica de Mexico (Set of Chess Men); H. Bühler, Bern, Switzerland (Electricity Generating Station); F. van Bulck, Brussels (Coal Truck Tipper); André Capart, Brussels (Motor Chassis); M. Carreras, Barcelona (Tractor); M. Charles, Le Mans (Gear Cutting Machine); W. Chatfield, Hamilton, Ontario (Vertical Lift Bridge); M. Chauvelot, Paris (Wool Winding Machine); E. Christensen, Copenhagen (Calculating Machine); W. Clement, Willington, Co. Durham (Models of Machine Tools); M. Cochie, Brussels (Electric Locomotive); W. Cole, Felbridge, Sussex (Motor Car Chassis); S. Coleman, London, W.10 (Motor Car Chassis); F. Coltman, Loughborough (Travelling Crane); W. Cripps, St. Albans (Traction Engine); W. Cross, Crossgates, Fife (Yacht); T. Cullaré, Barcelona (Inertia Machine); S. F. Desai, Bombay (Laboratory Balance); E. Dodson, South Wigston, Leicester (Elastic Weaving Machine); J. Estrello, Madrid (Military Tank, Crane, and other Models); M. Frigerio, Mouze (Electric Tramcar and Printing Machine); G. Howard, Ganderton, Auckland N.Z. (Log Hauling Truck); A. Gernaert, Brussels (Electric Telpher); P. Goffin, St. Gilles-Waes, Belgium (Beaming Machine); G. Goiffon, Marseille (Vertical Sawing Machine); C. Goodchild, London, W.12 (Grandmother Clock); W. Govan, Toronto (Locomotive); L. Grey, Cowes, I.O.W. (Mechanical Coaling Plant); R. Harris, Haywards Heath (Motor Coach); G. Henwood, Takapuna, Auckland, N.Z. (Cable-laying Machine); F. Heszig, Lotswill, Switzerland (Roundabout); H. Hill, London, S.W.16 (Sky-scraper); G. Honorè, Tourcoing, France (Wool Balling Machine); G. Jefferson, Ely, Cambs. (Electric Light Dimming and Colour Changing Machine); C. Keated, London, S.E.21 (Floating Crane); T. Kennett, Sheerness (Ship's Engine); F. Keys, London, S.E.22 (Beam Engine); F. Kielinger, Zürich (Device for Recording Vibrations); G. King, London, S.W.17 (Refuse-collecting Motor Lorry); L. Knill, Leeds (Crane); S. Kurlawala, Bombay (Circulating Pump); G. Leach, Sheffield (Excavator); J. Leeson, Brigg, Lincs. (Floating Whale Oil Factory, Church and Fire Engine); F. Lehavre, Liège (Roundabout); Mrs. D. Littlejohn, Peterhead (Motor Bus); A. Lord, Petersham, N.S.W. (Spinning Mule); B. Mace, Nottingham (Motor Lorry); J. Magnussen, Oslo (Sports Motor Car); Camillo Marcantonio, Rome (Aeroplane); J. Mareel, Tourçoing, France (Cement Mixer); G. Marmieri, Milan (Device for Viewing Steroscopic Photographs); F. Marquand, Woodville, N.Z. (C.P.R. Locomotive); J. Martin, Rotherham (Electric Trolley Omnibus); M. Merzeau, St. Jean d'Angely, Charente, L.Inf. (Crane, and other Models); J. Moncomble, Nice (Motor Lorry); T. Mumby, Caistor (Priestman Excavator); K. Murby, Cheltenham (Motor Bus Chassis); J. Nuttall, Heywood, Lancs. (Motor Chassis); V. O'Toole, Geelong, Victoria (Fire Escape); G. Page, Newcastle-under-Lyme (Wind Pump); A. Palmer, Ramsey, St. Marys, Hunts. (Racing Car); R. Pascaud, Chaumont, Hte. Marne (Locomotive); C. Pequiquot, Calais (Windmill); J. Pienaar, Johannesburg (Motor Omnibus); Willi Polke, Salzgetter, Germany (Rivetter); W. Pompe, Ysselstein, Utrecht (Vibration Recorder); J. Powell, Queensferry, Nr. Chester (Demonstrating Mechanical Principles); C. Rizzoli, Parma (Automatic Grab); A. Rose, Birmingham (Castle); E. Staplin, Bristol (Torsion Pendulum Clock); E. Stedman, Maidstone (Motor Lorry); H. Stevens, London, S.E.18 (Searchlight); R. Storrar, Letham, Ladybank, Fifeshire (Glider); L. Suarez-Inclan, Madrid (Ferris Wheel and Mountain Railway); W. Suter, Hadleigh (Structural Model); H. Symes, Johannesburg (Screw Cutting Lathe); C. Taylor, Ashburton, N.Z. (Steam Lorry); J. Thompson, Glasgow, W.4 (Striking Clock); G. Tremblay, Chicoutimi, Quebec (Motor Car Chassis); W. Trenholm, Eaglescliffe, Co. Durham (Petrol-driven Locomotive); M. Tschumi, St. Imier, Switzerland (Tramcar); V. Uyttenbroeik, Antwerp (Cargo Discharging Plant); J. Verdavainne, Valenciennes (Loom); H. Walter, Adelaide, S. Australia (Electric Rail Car); A. Warren, Norwich (Guillotine Cutting Machine); J. Wauquier, Houilles, Seine-et-Oise (Aeroplane Catapult and Cargo Hoisting Plant); E. Whatley, New Moston, Manchester ("Garratt" Type Locomotive); R. Willems, Hoboken lez-Anvers, Belgium (Electricity Generating Station, complete with Machinery); J. Wilson, Aberdeen (Wastepaper Cleaning Machine); A. Wiseman, Haverhill, Suffolk ("Sentinel" Steam Wagon); E. Worthington, Vancouver, B.C. (Canadian "Snagboat"); A. Wright, Westcliff-on-Sea (Sports Motor Car); B. Yves, Auxances, Viènne (Aeroplane).

The following Competitors each receive a Certificate of Merit

M. Baker, Wallington, Surrey; H. Buswell, Nottingham; W. Butler, Poynton, Cheshire; J. Capurro, Buenos Aires; M. Carreau, Croix; G. Cazin, Calais; W. Criblez, St. Imier, Switzerland; A. Dal Maso, Vicenza, Italy; A. Field, London, N.E.8; A. Figgett, Chatham; R. Forsyth, Stranraer; L. Gascoigne, Chelmsford; X. Giroud, St. Etienne; A. Guilourt, Bar-sur-Aube, Aube; M. Guilourt, Bar-sur-Aube, Aube, France; J. Howe, Belfast; L. Hurtley, Kingston, Nova Scotia; N. Ireland, Lytham-St.-Annes; Miss S. Jewell, Crapnell, Nr. Wells; J. Kerr, Dumfries.; M. Kucharsky, Montreal; F. Limat, Geneva; S. Luckin, Horley, Surrey; M. Machin, Moseley, Birmingham; T. MacLachlan, Dunedin; Magnifico Giuseppe, Bari, Italy; J. Prémont, Brussels; H. Rutter, Consett; C. Schmidt, Amsterdam; R. Simonin, Audincourt; P. Sisley, Surbiton, Surrey; W. Swinnen, Wavre, Brabant; E. Sykes, Johannesburg; Mrs. V. Sykes, Johannesburg; G. Thomas, Toulouse; W. Waters, London, W.C.1; H. Wright, Middlesbrough.

SECTION "B"

(*Competitors over 16 and under 18*)

Five First Prizes of Cheques for £5.5s.

Marson, L., Bexhill-on-Sea, Sussex (Refuse Collector).
McCain, C. J., Sydney, N.S.W. (Steam Wagon).
Park, A. S., Calgary (C.N.R. Locomotive).
Tombeaux, P., Courtrai (Bucket Excavator).
Viney, R., Manchester ("*Royal Scot*" Locomotive).

Five Second Prizes of Cheques for £4.4s.

Garner, J. K., Hampton-in-Arden ("Scammell" 65-ton Transporter Lorry).
Pantanella, Francesco, Rome (Typewriter).
Turner, E. S., Toronto (Petrol Tank Lorry).
Wallace, R. J., Wanganui, N.Z. (Mantel Clock).
Whalley, G., Brockville, Ontario (Dredging Crane).

15 Third Prizes of Cheques for £1.1s.

Begemann, C., Java (Girder Bridge).
Belkum, P. v., The Hague (Diesel Engine).
Bryant, H., Wellington, Som. (Double Deck Omnibus).
Colencrander, J., Braukelen, Holland (Crane).
Dommelen, H. V., Antwerp (Lifting Bridge).
Etherington, A., Bradford, Yorks. (Saloon Omnibus).
Fairfield, Miss W., Bowdon, Cheshire (Cable Machine).
Harris, J., Sanderstead, Surrey (Fortune-teller).
Heris, R., Brussels (Grabbing and Lifting Crane).
Hers, J., Potchefstroom (Calculating Machine).
Huszar, W., Bergen (Printing Press).
Johnston, A., Dunstable (Front Wheel Drive Omnibus).
Morris, R., Stratford-on-Avon (Dough Kneader).
Sokol, R., Buenos Aires (Electric Locomotive).
Stone, K. and Hurley J. (Joint Entry), Knowle, Bristol (Furniture Removing Van).

Meccano and Hornby Train goods to a total value of £50 divided among the following competitors

R. Ackroyd, Wakefield (Six-Wheeled Motor Lorry); G. Alington, Invercargill, N.Z. (Leyland "Hippo" Motor Lorry); W. Bais, Medan, Dutch East Indies (Motor Chassis); D. Baker, Birmingham (Six-Wheeled Motor Lorry); F. Baldauff, Luxembourg (Fire Engine); M. Barbera, Valencia (Mechanical Game); H. Bell, Hoylake, Cheshire (DO.X Flying Boat); W. Bellemare, Drummondville, Quebec (Cinematograph); C. Boras, Perigueux (Military Motor Lorry equipped with Anti-Aircraft Guns); J. Borgeron, Bayonne (Marine Engine); M. Bosch, Maastricht (Electric Crane); B. Bracci, Montepulciano, Italy (Scenic Railway); W. v. d. Broek, Utrecht (Swivelling Bridge); G. Brule, Longueville, Seine-et-Marne (Hammerhead Crane); R. Cabral, Buenos Aires (Motor Chassis); W. Cansick, London, N.1 (Six-Wheeled Steam Wagon); E. Casamada, Barcelona (Theatre); J. Churchward, Brighton, Victoria (Floating Crane); W. Clayton, Clondalkin, Co. Dublin (Four-Cylinder Marine Engine); A. Coenders, Utrecht (Electric Tramcar); F. Corby, Reading ("Scammell" Transporter Lorry); S. Cowley, Prestwich (Swing Bridge); W. Crichton, Glasgow (Steamship); H. Crook, Ashton-in-Makerfield (Racing Seaplane); C. Cuyas, Zaragoza, Barcelona (Loom); G. Dalvit, Buenos Aires (Typewriter); A. Davidson, Ashburton, N.Z. (Dragline); L. Davis, Essendon, Victoria ("Leyland" Motor Lorry); J. Delahaye, Armentieres (Gantry Crane); H. Dicken, Wrexham (Portable Crane); E. Eason, Wilmslow, Cheshire (Locomotive Crane); R. Emuss, Cranleigh, Nr. Guildford (Vacuum Cleaner); A. Farr, Norwich (L.N.E.R. "*City of York*" Locomotive); D. Field, Bruton, Som. (Motor Car); J. Foley, Kingwilliamstown, S. Africa (Model Workshop); E. Füsslein, Zululand (Gang Plough); N. Gernat, Leigh-on-Sea ("Sentinel" Steam Wagon); R. Gouldbourne, Newcastle-under-Lyme (Racing Car); Frederico Gorio, Rome (Catapult for Launching Aeroplanes); C. Green, Purley, Surrey (Electric Passenger Lift); L. Hadley, Toronto (Electric Locomotive); A. Hall, Accrington (Excavator); J. Hampshire, London, S.W.19 (Ocean Liner); A. Hampson, Widnes (Motor Chassis); R. Harman, Sydney (Omnibus); D. Harrison, Benalla, Victoria (D.H. "*Gipsy Moth*" Aeroplane); N. Heathcott, Salmon Arm, B.C. (Swivelling Crane); J. Hedley, Johannesburg ("Sentinel" Eight-Wheeled Steam Wagon); A. Helluy, Fismes, France (Monoplane Air-Liner); W. Hicken, Mansfield (Conveyor Bridge); W. Hills, Maidstone (Aeroplane); J. Holleboom, Amsterdam (Drilling Machine); M. Jamily, Orleans (Electric Locomotive); V. Kaile, Mayford, Nr. Woking ("B.S.A." Three-Wheeled Motor Car, Locomotive and Passenger Liner); M. Kaptein, Soest, Holland (Automatic Electric Contact Making-and-Breaking Machine); J. Kastelian, Stoke Newington (Cinematograph); V. Kateley, Dorking, Surrey (Lawn Mower); T. Kock, Kristianshavns, Denmark (Jib Crane); Armand Laquieze, Toulouse (DO.X Flying Boat); G. Lefevre, Oakham (Motor Chassis); Mariano de Luca, Naples (Threshing Machine); F. Macuie, Elland ("*Flying Scotsman*" Locomotive). R. Mason, Newcastle-under-Lyme (Planing and Surfacing Machine for Wood Working); J. Merce-Platero, Madrid (Autogiro Aeroplane); R. Midgley, Southampton (Motor Cycle, Sidecar and Trailer); E. Motley, Louth (Oil Engine); F. Muller, Mulhouse (Electric Tramcar); A. Ness, Port Dalhousie, Ontario (Lock Gate Lifting Crane); R. S. Newman, London, W.9 (Motor Coach); G. Nisbet, Melbourne (Electric Goods Locomotive); J. Offringa, Batavia, Dutch East Indies (Cargo Ship); N. Paola, Durban (Electric Tramcar); J. Phillips, Fulstow, N. Thoresby (Windmill); W. Richardson, Ballinscurra, Limerick (Ship Coaler); Lorenzo R. Riva, Modena (Threshing Machine); E. Rohan, Castleconnel, Co. Limerick (Locomotive and Rolling Stock); J. Rolt, Marlborough, Wilts (Single-Seater Racing Car); G. Rombach, Groningen (Tractor); J. Salietti, Pastells, Barcelona (Planing Machine); O. Schröter, Springs, S. Africa (Concrete Mixer); G. Schulz, Coromby, Australia (Victorian Railways Locomotive); H. Shorten, Regina (High Wing Monoplane); A. Singh, Lahore (Hammerhead Crane and Electric Fan); L. Smee, Watford (Eight-Wheeled Steam Wagon); W. Smith, Luton, Beds. (Omnibus); C. Stewart, Durban (Dock Crane); J. Tapsell, Beckenham, Kent (Military Tank); J. Taylor, Guildford (S.R.4–4–0 Locomotive); T. Tenuti, Trento, Italy (Machine for Recording Strength of Concrete); A. Thijsfen, Maastricht (Electric Locomotive and Rolling Stock); C. Tipton, Shrewsbury (Petrol Tank Lorry); A. Trollip, Johannesburg (Gold Ore Crushing and Loading Plant); K. Vickery, Canterbury, N.Z. (Shingle Screener); C. Vineall, London, E.14 (Letterpress Printing Machine); A. Wahid, Mysore (String Telegraph); R. Wallace, Melbourne (Ship Coaling Plant); J. Watson, Regina (Trenching Machine); H. Webb, London, N.22 (Revolving Hammerhead Crane, Air Liner and other Models); R. Whitney, Streetley, Birmingham (S.R.4–4–0 Locomotive); L. Wilcock, Sheffield (Breakdown Crane); L. Wilkinson, Regina (Radial Travelling Crane); H. Wilmot, Port Elizabeth (Steam Wagon); W. Wilson, Kenilworth (Four-Seater Motor Car); P. Woodman, Teneriffe, Canary Islands (Locomotive and Tender).

The following competitors in Section "B" each receive a Certificate of Merit

F. Agosti, Milan; R. Anderson, Ashfield, N.S.W.; J. Arbitre, Rouen; S. Bentley, Low Spennymoor, Co. Durham; G. Bersani, Rome; H. Bertreux, Nantes; C. Britten, Kings Lynn; M. Brockhurst, Hove, Sussex; F. Drane, Sudbury, Suffolk; G. Emery, Hall Green, Birmingham; H. Freeman, Southsea; A. Gardiner, Devizes; R. Gerin, Vienne, Isère, France; E. Holm, Hellerup, Denmark; K. Holmstrom, Kalmar, Sweden; M. Hoozemous, Vlaardingen, Holland; H. Hugill, Bootle; W. Kilburn, Dewsbury; G. v. d. Linden, Hilversum; Roger Marquier, Toulouse; H. McMillan, Baschurch, Shropshire; R. Message, Dartford; E. Michel, Bormes, Var., Belgium; E. Parker, St. Leonards-on-Sea; A. Pol, Apeldoorn, Holland; F, Semeria, Savona, Italy; A. Tearall, Edgware; J. Thompson, Blenheim; R. Turner, Subiaco, W. Australia; H. B. Tweedy, Stroud; Jaime Villà, Barcelona; H. West, Purley, Surrey; Ubaldo Zenoglio, Genoa.

SECTION "C"

(Competitors over 12 and under 16)

Five First Prizes of Cheques for £4.4s.

Ingram, Kenneth W., Highwood, Nr. Chelmsford (A.E.C. Six-Wheeler Motor Lorry).
Robert, André, Johannesburg (Fire Escape).
Tanner, Kenneth, Johannesburg (Book-maker's Sewing Machine).
Thompson, J. D., London, N.11 (Gipsy Caravan).
Vanderlinden, E., Antwerp (Antwerp Cathedral).

Five Second Prizes of Cheques for £3.3s.

Akrell, Carl, Stockholm (Automatic Dredging and Gravel Sorting Machine).
Lane, R., West Croydon, Surrey (Floating Crane).
Medd, David L., Hazelhead, Aberdeen (Jib Crane).
Rainforth, Tom, Palmerston North, N.Z. (Mower).
White, Victor, London, W.3 (Motor Cycle Van).

15 Third Prizes of Cheques for £1.1s.

Bartalena, Guido, Pisa (Military Tank).
Dodds, George E., Stratford, Ontario (Locomotive).
Grubb, Eric, Vancouver, B.C. (Electric Locomotive).
Hâche, René, Paris (Dragline).
Harling, D. W., St. Albans (Racing Car).
d'Humières, Géraud, Versailles (Monoplane Air-Liner).
Johannsen, Hans Herbert, Varel, Germany (Tractor).
Kietzman, Vincent G., Johannesburg (Racing Car).
King, S. D., Palm Bay, Margate (Motor Omnibus).
Malefijt, T. H. de Waal, Arnhem, Holland (Coupè).
Robson, Thomas, Scarborough (Steam Trawler).
Roden, H., Kilmacolm (Passenger Liner).
Sórbye, Hákon, Oslo (Hammerhead Crane).
Wells, Kenneth N., Newport, I.O.W. (Machine for making Wood-and-Wire Fencing).
Whittet, Martin M., Glasgow, W.3 (Ship Dredger).

Meccano and Hornby Train goods to a total value of £40 divided among the following competitors

W. Abery, Durban (Aircraft Carrier); F. d'Almeida e Castro, Lisbon (Seaplane); P. Andersin, Helsingfors ("*Rocket*" Locomotive); R. Anderson, Rangoon, Burma (Breakdown Crane); R. Armstrong, Twickenham (Designing Machine); G. Athey, Hull (Locomotive Coaling Plant); G. Atkinson, Port Elizabeth (Saloon Motor Car); J. Barber-Starkey, Victoria, B.C. (Mechanical Dredger mounted on Motor Truck); W. Barber, Hornchurch, Essex (Saloon Motor Car); A. Blanck, Sarreguemines (Aeroplane); W. Blunden, Sydney, N.S.W. (Motor Car Chassis); R. Boddey, Ipswich (Travelling Jib Crane); A. Boeke, Baarn, Holland (Striking Clock); G. Bouton, Brussels (Crane); J. Bowers, Hill Top, Wilmslow (Motor Omnibus); R. Bühler, Zürich (Aeroplane); A. Bury, Liége (Inclined Railway); R. Chauvin, Vitrè, France (Aeroplane); L. Cohn, Melbourne (Destroyer); J. Collins, Elwood, S.3, Victoria (Destroyer); J. Comper, London, S.W.8 (Paper Cutting Machine); G. Cory, Notgrove, Nr. Cheltenham (Hay Stacker); P. Critchley, Brighton (Traction Engine); J. Dekker, Hilversum (Electric Locomotive); André Denel, Lille (Grabbing Crane); H. Denholm, Hobart (Crane); G. Doughi, Venice (Scenic Railway); Miss Muriel Franklin, Victoria, B.C. (Vertical Lifting Bridge); S. Furniss, Blackpool (Aeroplane); W. Gassmann, Zürich (Electric Locomotive fitted with Pantograph Current Collectors); R. George, London, S.W.8 (Trolley Omnibus); P. Gibout, Paris (Crane); B. Ginders, Wellington, N.Z. (Bacon Slicing Machine); J. Girardeau, Thouars (Field Gun and Limber); W. Girogi-Alberti, Spoleto (Telpher and Girder Bridge); E. Goffin, Brussels (Aeroplane); R. Goffin, Roubaix (Military Tank and Motor Tractor); W. Griffith, Durban (High Wing Monoplane); H. Groendijk and F. de Beer (joint entry), Ternaard, Holland (Dutch Windmill); R. Guillorit, Nantes (Models of a House and Ship); D. Gysen, Brussels (Motor Chassis); E. Hallam, Johannesburg (Self-propelled Floating Crane); H. Hart, London, W.12 (Leyland Removing Van); G. Hawkins, Remuera, Auckland, N.Z. (Road Motor Power Grader); B. Heath-Brown, Farnham, Surrey (Block-setting Crane); G. v. d. Helm, Hilversum (Trolley Omnibus); E. Hewines, Stafford (Electric Crane); B. Hill, Durdham Down, Bristol (Jib Crane); A. Hull, New Milton, Hants. (Aeroplane); W. Hunt, London, W.5 (Steam-driven Model Workshop); A. Hurden, London, N.1 (Refuse Collecting Motor Lorry); J. Isaksen, Oslo (Portable Luggage Escalator); W. Jones, Christchurch, N.Z. (Aeroplane); K. Kharé, Poona (Automatic Scenic Railway); P. Kilpin, Kenilworth, S. Africa (Floating Crane); R. Kratzenberger, Berlin, N.W.87 (Cement Mixer); R. Larnic, Paris (Rock Breaker); A. Leonard, London, S.E.3 (Six-Wheeled Omnibus); T. Lewis, Johannesburg (Breakdown Crane); P. Lillywhite, Farnham, Surrey (Motor Lorry); L. Lynne, Littledean, Glos. (Motor Fire-Engine and Escape); M. Lyzet, Caudéran, Gironde (Mechanical Washing Machine); W. McKay, Wishaw (Portable Steam Crane, driven by Meccano Steam Engine); E. Matter, Ermatingen, Thurgan (Locomotive and Tender); P. Mead, London, E.18 (Coke Grading Machine); J. Merson, Stockton-on-Tees (Cruiser); J. Michel, Annecy, Haute-Savoie (Travelling Crane); D. Moyle, Johannesburg (Racing Car); R. Nicholas, Islington, Ontario (Bird Cage and Stand); S. Noall, Avondale, Auckland, N.Z. (American Locomotive); P. Opprecht, Schaffhausen (Motor Lorry); K. Orams, Blenheim, N.Z. (Tractor with Plough); F. Pamicke, Heilingenstadt, Germany (Military Tank); L. Paris, Orleans (Bugatti Sports Motor Car); D. Parker, Stafford ("Sentinel" Steam Wagon); M. Pasquie, Castelsarrasin, France (Cable-laying Machine); J. Petitjean, Paris (Sewing Machine); J. Read, Johannesburg (Omnibus); K. Reeves, Johannesburg (Motor Wagon for carrying Sugar Cane); A. Régis, Alger, Algiers (Grabbing Crane mounted on overhead gantry); P. Renbjor, Levanger, Norway (Crane, Steam Engine, Motor Car, and other models); Seivrta Rosario, Palermo (Revolver); G. Sabajno, Milan (Two-Seater Motor Car); E. Salmon, Retford, Notts. (Signal Cabin); H. Sandoz, St. Imier, Switzerland (Aeroplane Excavator); P. Senft, Barr, France (Aeroplane and Long Range Gun); R. Shepherd, Weymouth (Safe with Combination Lock); K. Siddon, Woodbridge, Suffolk (High Wing Passenger Monoplane); V. Slovet, Figueras, Spain (Calculating Machine); V. Souccer, Alexandria (Steam Excavator, Telephone and Electric Fan); A. Storer, Ilford (Eight-wheeled Tram Car); J. Street, Sydney, N.S.W. (Seaplane and Ocean Liner); I. Taylor, Hawera, N.Z. (Dreadnought and Locomotive); G. Twyman, Canterbury (Motor Lotry, Ship and other Models).; F. Ugalde, Buenos Aires (Agricultural Machinery); D. Wade, Melbourne (Saw Mill); D. Weller, Hampton Wick (Trolley Omnibus); H. Whitehouse, Kings Heath, Birmingham (Derrick Crane); P. Williams, Johannesburg (Jib Crane); R. Williams, London, S.W.20 (Trolley Omnibus); W. Willot, Louvain, (Roundabout and other models); J. Wingsheim, Frenchen, near Cologne (Convertible Trenching Machine); H. Wirth, Untersee, Bern (Electric Locomotive); P. Worfolk, Caterham Valley, Surrey (Sports Motor Chassis); P. Yates, Johannesburg (Tractor); B. Yonge and J. Hooper. (joint entry), Sydney, N.S.W. (Dockside Crane).

The following competitors in Section "C" each receive a Certificate of Merit

J. Aitken, Haddington; N. Allard, Coventry; R. Angus, Plymouth; L. Aschan, Helsingfors; Armand Barbezat, Paris; K. Batchelor, Dorking; E. Bednall, Littleover, Nr. Derby; J. Bell, Bootle; K. Best, Leeds; J. Beule, St. Pierre, France; J. Bevan, Neath; M. Biggs, Christchurch, N.Z.; C. Bills, Blackpool; J. Blanarsch, Strasbourg; Raffaele de Blasi, Palermo; J. Bolibar, Barcelona; R. Boom, Hengelo-Overijssel; H. Bowley, Edmonton; R. Brangwin, London, N.1; E. Braussi, Pesaro; R. Brenni, Mendrisio, Ticino, Switzerland; T. Brook, Rossburgh, Natal; R. Bruce, Shipley; A. Bruggencate, Heiloo, Holland; N. Brummelen, Utrecht; G. Bunker, Grimsby; C. Burns, Edinburgh; W. Cain, Watford; A. Campbell, Exmouth; I. Campbell, Milngavie, Glasgow; E. Chagoury, Cairo; P. Chappell, London, W.13; J. Charot, Fontenay-le-Comte; R. Chasseriaux, Parthenay, France; T. Clark, Strabane, Co. Tyrone; K. Colencrander, Breukelen; F. Collins, Whalley Range, Manchester; W. Commer, Geneva; P. Court, Cannes; R. Crawford, Ottawa; F. Crighton Bayly, Kilmacolm; J. Cullen, London, E.6; D. Dadd, Moss Vale, N.S.W.; G. Dean, Newcastle-on-Tyne; Raffaele de Blasi, Palermo; R. Debrill, Lillè; L. Defries, Streatham, London; J. Del Giudice, Barcelona; E. Deller, Watford; P. Devie, Lyons; J. Doyle, Melbourne; H. Eikermann, Mulheim a/d Ruhr, Germany; S. Ekman, Kneippbaden, Sweden; J. Etches, New Westminster, B.C.; R. Ewan, Cheriton Bishop, Exeter; R. Exley, Stockbridge, Keighley; C. Farr, Horsforth, Nr. Leeds; E. Firth, Sandbach, Cheshire; A. Ford, Wokingham; Jean Francois, Sedan, France; J. Gentle, Coatbridge; D. Gerdesfen, Utrecht; P. Gill, Bristol; Som.; G. Good, Liverpool; R. Gould, Mapledurham, Nr. Reading; A. Greaves, Skegness; C. Greener, Maghull, Nr. Liverpool; R. Manen Grenier, Barcelona; C. Grunfeld, Geneva; H. Haas, Leiden; G. Halsema, Ermelo, Holland; D. Hannah, Grinshill, Nr. Wem, Salop; W. Hart, London, N.1; J. Hay, Knutsford; C. Hilton, Hollins, Oldham; H. Holton, Ootacamund, S. India; B. Hooke, Blackburn, Victoria; N. Hooke, Blackburn, Australia; D. Horrocks, Leigh; G. Howard, Watford; R. Hubert, Guernsey; L. Hugers, Nijmegen; C. Humn, Geraldine, N.Z.; V. Jackson, Wellingborough; R. James, Sharrow, Sheffield; F. Jonas, Greifswald, Germany; K. Keays, Cape Town; J. Kennedy, London, W.1; C. Kerr, Langside, Glasgow; F. Kick, Zürich; R. Kidman, London, N.6; H. Läng, Zürich; E. Larsen, Copenhagen; A. Leekswa, Semarang, Java; A. Letuvé, Le Havre; K. Lewis, St. John's, Newfoundland; A. Lichenstein, Danielskuil, Cape Province; A. Lischetti, Villa Constitucian, Argentina; R. Long, Mexico City; J. Lovett-Turner, Blockley, Glos.; A. Lowe, Lenton, Nottingham; W. Lubberstedt, Herisau; M. McDonald, Ranelagh, Dublin; H. McDowell, Lurgan; A. McGregor, Wallsend; G. McGregor, London, S.W.20; K. MacKenzie, Belfast; D. Malin, Mickleover, Nr. Derby; H. Mantle, Kimberley; J. Mapplebeck, Huddersfield; A. Marlow, Kroonstad, O.F.S.; L. Massey, Poznan, Poland; H. Mattheyer Zeist, Utrecht; G. Merrett, London, W.1; T. Miller, Netherlee, Glasgow; P. Milton, Beckenham; W. Muller, Dunkeld, Johannesburg; R. Neave, Norwich; L. Neven, Limburg, Belgium; S. Norden, Sydney, N.S.W.; A. Nunn, Exmouth; E. Paasche, Bergen; N. Pairman, Newcastle-on-Tyne; Giovanni Papa, Naples; L. Paris, Orleans; J. Payne, Hull; H. Pell, Hamilton, Ontario; J. Pickles, Bradford; H. Piet, Wormer, Holland; J. Pippard, Clifton, Bristol; F. Pollman, Steinheim i/Westf, Germany; T. Ponoe, Rio Negro, Argentina; B. Ramboult, Sallris, France; A. Reid, Edinburgh; W. Reeve, Hobart; P. Robson, Cardiff; H. Rothschild, Zürich; J. Sanders, Tilburg, Holland; G. Scales, Scarborough; N. Smee, Bartonville, Ontario; A. Smith, Braintree; G. Somerwill, Southampton; W. Sommer, Geneva; O. Sörensen, Drammen; P. Suarth, Clevedon, Som.; E. Tait, Durban; J. Taylor, Chapel-en-le-Frith, Derbys.; F. Teggin, East London; O. Thomas, Cowbridge, Glam.; D. Thorburn, Nobleford, Alberta; F. Thornton, Scarborough; F. Tousberg, Oslo; E. Treharne, Port Talbot; F. Troelstrup, Copenhagen; M. Tweedie, Tilehurst, Berks.; R. Vrel, Orleans; J. Waller, London, N.7; H. Ward, Tong Branch, Ontario; E. Wareham, Kings Norton, Birmingham; A. Weiler, Luxemburg; J. Westhead, Stockport; P. Whale, London, S.W.16; J. Whittle, Wigan; J. Whyte, Toronto; D. Wilde, Rhos-on-Sea; N. Wright, Melton Mowbray; R. Wright, St. Albans.

SECTION "D"

(Competitors over 10 and under 12)

Five First Prizes of Cheques for £3.3s.

Beard, W. C., Johannesburg (Gold Mine Headgear).
Canepa, Emilio, Genoa (Grain Crushing Machine).
Kellett, Wilfred, Bradford (Milling Machine).
Rickett, John W., Takeley (Self-Binder Harvester).
Sharpe, Clifford P., Ilford (Household Gas-Cooker).

Five Second Prizes of Cheques for £2.2s.

Bayona, Jaimè, Barcelona (Motor-Cycle Delivery Van).
Cescatti, Adolf, Zurich (Windmill Pumping Plant).
Fraser, B. R., Farnham Common, Bucks. (Jib Crane).
Hough, Ronald, Wallington, Surrey (Coke Oven Ram).
Rossi, Allessandro, Schio, Italy (Toboggan Railway).

15 Third Prizes of Cheques for 10s.6d.

Brouwer, J., Rotterdam (Double Lifting Bridge).
Carrasco, R. Marsal, Denia (Loom and Locomotive).
Chambure, H., Paris (Front Wheel Drive Chassis).
François, B., Cherbourg (Omnibus).
Hall, J., Louth (Swivelling Jib Crane).
Hole, Frederick W., Taunton (Trolley Omnibus).
Lambert, G., Nottingham (Grandfather Clock).
Lizer, G., Retford (Grandfather Clock).
Rose, P., Pinetown, Natal (Motor Pullman).
Schell-Gossow, L., Bandoeng, Dutch East Indies (Three-Wheel Native Motor Carriage).
Slosse, René, Hoboken, Antwerp (Wind Motor).
Waldvogel, F., Brennen, Switzerland (Machine for Carrying Paper in Bulk).
Wegel, P., Le Havre (Steam Driven Lathe).
Yves, P., Nantes (Crane).
Zuyben, R. v., Liége ("*Silver Bullet*" Racing Car).

Meccano and Hornby Train goods to a total value of £30 divided among the following competitors

G. Allen, Croydon (Crane); Jorge Anglada, Barcelona (Crane); G. Armstrong, Carlisle (Twin-Wheel Drive Motor Lorry and Trailer); L. Balasch y Allenbach, Barcelona (Motor Lorry); J. Baron, Saintes, Ch. Inf. (Motor Car); R. Barr, Hamilton, Ontario (Suspension Bridge); M. Barua, Shillong, Assam (Fortune-Telling Machine); J. Beck, Raveningham, Norwich (Portable Log Saw); M. Beddeleem, Wetteren, Belgium (Fire Engine); P. de Bellefeuille, Ottawa (Railway Crane); P. Callister, Wairarpa, N.Z. (Racing Car); J. Cantet, Chaton, Seine-et-Oise (Racing Car); B. Chaix, Geneva (Motor Car); V. Chatillon, Lyons (Signal Gantry); L. Charles, Kaalagate, O.F.S. (Wayside Station); R. Clausse, Avallon, Yonne (Railway Points); G. Cowen, Kitale, Kenya Colony (Motor Car); J. Crotin, Paris (Saloon Motor Car); E. Dean, Backford, Nr. Chester (Travelling Crane); P. Deischburg, Luxembourg (Water Pumping Plant); J. Degoy, Petit Quévilly, Siene-Inferieure (Lifting Jack); J. Dony, Clermont-Ferrand (Aeroplane); M. Dumont, Liancourt (Heavy Motor Lorry for Carrying Logs); R. Eicher, Luxembourg (Motor Car); C. Evans, Hale, Nr. Altrincham (Double-Deck Omnibus); N. Ewing, Durban (Floating Crane); D. Fanquet, Bayonne (Air Liner); M. Fels, St. Nikolaas, Belgium (Transporter Bridge); D. Franklin, Victoria, B.C. (Block Crane, Mine Shaft and Cage); R. Freshwater, Reigate (Military Biplane); K. Froome, Windsor (Passenger Liner); J. Fry, Sydney (Level-Luffing Crane); W. Genge, Cranbrook, Kent (Portable Steam Crane); O. Goff, Dublin (Monoplane); T. Gorbenko, London, W.5. (Passenger Liner); B. Green, Salisbury, S. Rhodesia (Crane); R. Griffiths, Mossley Hill, Liverpool (Crane and Transporter); H. D. Hardt, Saarbrucken 111, Germany (Typewriter); R. Harrington, Umtali, S. Rhodesia (Six-Wheeled Motor Lorry); C. Haw, Heworth, York (Wireless Detecting Van); W. Hill, Benton, Northumberland (Motor Chassis); J. Hodin, Paris (Automatic Ticket Distributor); J. M. Horrox, York (Trolley Omnibus); D. Howes, Birmingham (Tank Locomotive); G. Hutchinson, Abergele ("Toast Rack" Street Car); D. Jackson, Leeds (Aeroplane); K. James, Balclutha, Otago, N.Z. (Motor Breakdown Crane); B. Johnson, Bridlington (Aeroplane); R. Keay, Richmond (Hammerhead Crane); R. Lancon, Marseilles (Pile Driver); R. Landsmann, Giersdorf i Rsgb., Germany (Elevator); C. Latham, Bristol (Fire Engine); A. le Claire, Worksop (Train Ferry); B. Lensvelt, Isle of Walcheren (Lighthouse); J. Lock, Dorrington, Nr. Shrewsbury (Hydraulic Crane); R. McCall, Cork (Sports Motor Car); P. MacDonald, Coe Hill, Ontario (Railway Breakdown Crane); A. Macleod, Clevedon, Som. (Pneumatic Drill); P. Mailliard, Paris (Turbine-propelled Speed Boat); R. Maltha, Rotterdam (Cargo Steamer); C. Maquet, Dinan (French Carrosse); D. Mitchell, Grenada, British West Indies (Rifle, Racing

Car and Locomotive); P. Moir, Walmer, S. Africa (Motor Car and Traction Engine); G. Monro, London, W.2 (Pile Driver); E. Moreau, Neuville-aux-Bois, Loiret (Helical Wire Saw, driven by Electric Motor); B. Mulot, Honfleur (Telpher); E. Nannestad, Ringe, Denmark (Motor Lorry and Trailer); J. Oudy, Orléans (Transporter Bridge); C. Pareja, Brussels (DO.X Flying Boat); J. Pearce, London, N.7 (Motor Lorry); L. Petit, Vienne, Isère (Workshop); L. Peyrol, Gardanne, Bouches-du-Rhône (Calcining Plant); Y. Peyrol, Gardanne, Bouches-du-Rhône (Aeroplane); G. Philpott, Rangiora, Canterbury, N.Z. (Baby Carriage); B. Piet, Wormer (Belt Elevator); E. Ramoger, Calais (Three-Masted Sailing Ship); G. B. Riley, New Brighton (Kitchen Cooking Range); J. Salvetat, St. Amans-Soult, France (Tractor and Trailer); W. Salzmann, Solothurn (Lorry); D. Savage, Vancouver, B.C. (Clock); H. Schmia, Thurgau, Switzerland (Rail-making Machine); D. Scott-Job, London, N.W.6 (Mechanical Butter Churn); H. Sevenich, Cologne (Electric Washing Machine); W. Sharrard, Lincoln (Electric "Mule" as used on the Panama Canal); D. Simpson, Edinburgh (Girder Crane); H. Smith, Bickley (Dragline); E. Solomon, Balkuling, W. Australia (Paddle Steamer); W. Southcote, Portsmouth (Double-Deck Omnibus); G. Spindler, Mulhouse (Heavy Motor Van); A. Thomson, Faversham (Military Lorry fitted with Searchlight and Anti-Aircraft Gun); G. Thomson, Pinner (Long Range Monoplane); C. Tomblin, Johannesburg (G.P.O. Mail Van); L. Trepp, Osnabrück, Germany (Motor Car); F. Underdown, Sydney (Pit-head Gear); H. v. der Veen, Amsterdam (Drawbridge); P. Vine, Ewell, Surrey (Traction Engine); A. Vink, Den Haag (Tower Jib Crane); B. Waitt, Southend-on-Sea (Steam Tug-Boat); J. de Walsche, Roubaix (Petrol Tank Motor Lorry); C. Wilmet, Arlon, Belgium (Metronome); A. Wonters, Malines (Airship); B. Woodward, Grafton, N.S.W. (Motor Cycle); J. Yeats, Farnham (Signal Box).

The following competitors in Section "D" each receive a Certificate of Merit

J. Balhan, Den Haag; R. Brodersen, Charlottenlund, Denmark; R. v. d. Bruele, Oulst; G. Bruteau, Brussels; J. Burdin, Longton, Lancs.; G. Busquet, Lyons; A. Chesneau, Rouen; P. Chevillard, Angers; C. Chown, Slough; Bruno Cingano, Brescia; J. Collignon, Paris; L. Cottini, Montepulciano, Tozcana; R. Curpin, Sancerre; K. Duncan, Norsewood, N.Z.; J. Gachassin, Saint Henry, France; G. Giorgi-Alberti, Spoleto, Italy; O. Godaux, Morlanwelz; A. Gorsse, Cordes, France; B. Guttridge, Bournemouth; P. Hasseriis, Vejen, Denmark; J. Hernandez Roig, Barcelona; K. P. Kharé, Poona; J. de Laroche, Paris; J. Lawson, Levenshulme, Manchester; A. Manganelli, Senigallia; T. Marshall, Bala; F. v. Meenen, Bruges; H. Merryweather, Sangudo, Alta.; P. Mertz, Useldingen, Luxembourg; H. S. Moody, Bowmanville, Ontario; R. Novick, Toronto, Ontario; E. Orellan, Cadiz; J. Oudar, Calais; A. Ricci, Perugia; B. Rivron, Ipswich; N. Rubin, Stockholm; W. Ryder, Newcastle, Natal; G. Sammicheli, Intra; J. Schoos, Beverwijk, Holland; O. Ström, Eksjö, Sweden; A. Sutton, London, S.W.20; C. Tatti, Torino; E. Tossi, Capodistria; L. True, Leicester; E. Ulli, Huttwil, Bern, Switzerland; J. Varier, Trilport, France; J. Vatinel, Colombes; M. Vollenweider, Horgen; R. Walford, Newton Abbot; T. Walker, Ohura, N.Z.; R. Waller, Zug; D. Westall, Chesterfield; W. Wardroper, Vancouver, B.C.

R. Alby, Castlemandary, Aude; R. Allen, Malvern Wells; Y. Andrillon, Saintes, Charente Inf.; R. Aubert, Paris; R. Aufrère, Milan; R. Auriau, Savigny-sur-Braye; A. Austin, Auckland, N.Z.; J. Barguenden, Paris; D. Benn, Springs, Transvaal; D. Berkin, Kuling, China; J. Berrett, Westbury, Wilts.; Miss M. Bertrand, Ciney; M. Billiet, Madeleine, Nord; B. Bond, Toronto, Ontario; A. Brearley, Sowerby Bridge; A. Broadhead, Firth Park, Sheffield, E. Bromfield, Johannesburg; L. Bunn, Devizes; R. Carrer, Venice; M. Chaplin, London, N.8; J. Chomley, Marandellas, S. Rhodesia; L. Clark, Daybrook, Notts.; R. Coinaud, Limoges, Hte. Vienne; P. Condamin, Aniche, Nord; J. Dréan, Asnières; P. Duboisset, Marseille; J. Duvaché, Arcachon, Gironde, France; I. Ellefsen, Plumstead; C. Erizé, Alger, Algiers; T. Eyre, Warrington; T. Farnworth, London, E.4; C. Fielding, Longsight, Manchester; R. Fortems, Genappe, Belgium; A. Frankland, Ravenstonedal, Westmorland; D. Frearson, London, E.11; G. Galimand, Aisne; G. Gera, Sliema, Malta; G. Gevraux, Paris; B. Gravely, Wellingborough; J. Guillemart, Epernay, Marne; T. Hardie, Troon, Ayrshire; C. Haw, Heworth, Yorks.; T. Hedgcock, East Rand, Transvaal; V. Hendrickes, Louvain; F. Hill, Washington Station, Co. Durham; J. Houghton, Cheltenham; R. Huddy, Watford; H. Hughes, Criccieth; J. Huyter, Utrecht; C. Jouannaud, La Madeleine, Nord; A. Kelly, Ryton-on-Tyne; D. Kerswell, Chillington, Kingsbridge, Devon; P. H. Klussmann, Hallbrook, Hamburg; C. Kuchly, Sarrebourg, Moselle; B. Kuipers, London, N.10; J. Larpent, Le Havre; J. Lead, Harrow; E. Lubche, Berlin; A. Mahon, Bickley; C. v. Maldeghem, Brussels; F. Merienne, Paris; G. Merolle, Paris; W. Meyer, Weinfelden, Thurgau; P. Michaillard, Delle, Belfort; D. Miller, Auckland, N.Z.; G. Mirams, Moseley, Birmingham; W. Muller, Ostfriesland; N. E. Nerell, Stockholm; P. Northcote, Leominster; H. Ornal, Paris; J. Pasquier, Compiegne, Oise, France; K. Payne, Shucknall, Nr. Hereford; A. Pippard, Clifton, Bristol; M. Prévot, Feignies, Nord; J. Protics, Pressburg, Bratislava, Czechoslovakia; J. Rasselet, Aisne; R. Revol, Puy de Dôme, Clermont-Farrand; J. Ribra, Barcelona; R. Rider, London, S.W.10; J. Rigal, Houilles, Seine-et-Oise; K. Ripley, Huddersfield; G. Rivière, Pellegrue, Gironde; W. Rüegger, Lotzwill, Bern, Switzerland; H. Schaffer, Göttingen; O. Schulze, Lydenburg; G. Seigrist, Dossenheim-sur-Zinsel, Saverne; L. Slijkoord, Utrecht; J. Smith, Roxburgh; M. Sordel, Aubepierre, Hte. Marne; H. Spanswick, London, S.E.12; J. Stocker, Christchurch, N.Z.; G. Tait, Christchurch, N.Z.; Miss Dorothy Thorne, Chesham; M. Thorn, Ottery-St.-Mary, Devon; R. Ury, Arcueil, Seine; C. Wade, Huddersfield; J. Walton, Penwortham Hill, Preston; R. Walton, Ryde, Isle-of-Wight; H. v. Witsen, Mentone, Garavan, Alpes Maritimes; G. Wuilmot, Hans-sur-Sombre, Namur; G. Yorke, Pretoria.

SECTION "E"

(Competitors under 10 on 31st Mar., 1932)

Five First Prizes of Cheques for £2.2s.

Baldwin, P. L., Sacombebury, Nr. Ware (Mower).
Bryant, M. H., Skipton (Locomotive and Tender).
Clairèt, G., St. Ouen, France (Suspension Bridge).
Le Claire, P. B., Worksop (Rowing Boat and Crew).
Plewman, R. P., Sunnyside, Pretoria (Ox Wagon).

Five Second Prizes of Cheques for £1.1s.

Chew, A., Wilmslow, Manchester (Drawbridge).
Fairfield, P., Bowdon, Cheshire (Tractor-Trailer).
Karl, W., Skargvhagen, Oslo (Crane and Tower).
Molle, Jacques, Brussels (Device for recording the expansion of Metal when heated).
Robert, André, Orgères-en-Beauce, France (Swing Boats).

15 Third Prizes of Cheques for 10s. 6d.

Appleby, J., Bridlington ("Shamrock" High-Flyers).
Bolleter, Albert, Zürich, Switzerland (Crane).
Brown, R., Ngaruawakia, N.Z. (Portable Hay Stacker).
Dauncy, R. M., Redditch (Observation Tower).
Dulieu, B. L., Canterbury, N.Z. (Steam Trawler).
Hendricks, D., Quetta (Oil Well Derrick).
Jepson, D., Longsight, Manchester (Tank Locomotive).
King, Ian, Berbice, British Guiana (Tractor).
Lindahl, Anders, Karlshamn, Sweden (Motor Truck).
Niven, S., Dundee (Dredger).
Passmore, D., Torquay (Saltash Bridge).
Picou, Claude, St. Denis, France (Electric Crane).
Quiroz, J. M., Colonia del Valle, Mexico (Wind Motor).
Rawling, D., Openshaw, Manchester (Crane).
Tangeras, Jean, Vertheuil-en-Medoc, Gironde, France (Garage complete with Motor Cars).

Meccano and Hornby Train goods to a total value of £20 divided among the following competitors

P. Ashlin, Weston-super-Mare (Cargo Boat); P. Bailey, Edgware (Travelling Crane); P. Banks, Firth Park, Sheffield (Simple Cinematograph); Ilo Barbensi, Livorno, Toscana (Air Liner); R. Bel, Paris (Motor Bus); G. Bennett, Warlingham, Surrey (Windmill operated by a Coin-in-the-Slot Mechanism); J. Bertrand, Ciney, Belgium (Chariot); Miss Amie Beyleveld, Steynsburg, Cape Province (Rock-drilling Machine); W. Beyleveld, Steynsburg, Cape Province (Motor Lorry); Bruno Bolaffio, Milan (Pile Driver and Motor Car); P. Bonnet, Paris (Field Gun and Limber); R. Bourhill, Gorebridge, Midlothian (Tipping Motor Lorry); E. Bramley, Burton-on-Trent (Steamship); K. Brown, Franksten, Victoria (River Boat); D. Butson, Hankow (Travelling Crane); Luigi Camisassi, Saluzzo, Cuneo (Breakdown Crane, and other Models); J. Carreau, St. Dizier, Hte. Marne (Device for French Knitting); G. Castle, London, N.10 (Traction Engine); B. Catchpole, Altrincham (Household Gas Cooker); R. Cheshire, Pershore (Breakdown Crane for Motor Vehicles); M. Cowlin, Attenborough, Nr. Nottingham (Centrifugal Railway); F. Cressier, Lugnorre Vully, Switzerland (Potato Reaper); H. Cruickshank, Edinburgh (Three-engined Air Liner); L. Darras, Colombes, Seine (Atlantic Liner); R. Daubeny, Newton Valence, Alton, Hants. ("*Novelty*" Locomotive); J. Davrinche, Arras (Police Patrol Boat); R. Dehillotte, Perigueux (Rickshaw and Coolie); R. Downs, London, W.3 (Belt Conveyor); P. Dugast, Morbihan (Motor Tank Lorry); D. Duke, Brechin, Angus (Jib Crane); I. Edmond, Chelmsford (Floating Crane); W. Edwards, Risalpur, India (Army Transport Cart); J. Ellis, Altrincham (Aeroplane); J. Fabre, Paris (Gantry Crane, and other Models); D. Fisher, Edgware (Wool Winder); J. Foucher, Vendée (Aeroplane); R. Gadsby, London, E.7 (Lifting Truck and Goods Platform); H. Giard, St. Germain-en-Laye, Seine-et-Oise (Steam Excavator); J. Gillaumin, Orléans (Endless Chain Elevator); H. Gits, Harderwijk (Crane); J. Groslier, Paris (Transporter Bridge); R. Hadley, Langley, Birmingham (Fire Escape); R. Hervet, St. Quentin, Aisne (Paper Folding Machine); R. Holgate, Fives-Lille (Printing Press); J. Hubert, Pont-sur-Yonne (Hydro-Cycle); A. Husser, Colmar, Hte. Rhin (Motor Lorry fitted with Searchlight); A. Jenkins, Keswick (Aeroplane); R. Jones, Acocks Green, Birmingham (High Wing Monoplane); J. Joubert, Paris (Printing Press); H. Larsen, Copenhagen (Aeroplane); G. Laure, Le Perreux, Seine (Transporter Bridge); D. Leadbeater, Horsforth, Leeds (Aeroplane); M. Lefort, Athus, Belgium (Windlass); B. Lelievre, Sotteville les Rouen, Seine Inf. (Transporter Bridge); W. Linton, Kilmarnock (Steamship); G. McDougall, Ararat, Victoria (Motor Breakdown Service Wagon); G. McKirdy, Staines (Battle Cruiser); H. Marceau, Abilly, Indre-et-Loire (Flower-pot Making Machine); R. Michel, Maromme, Sein Inf. (Motor Bus and Tractor); R. Michel, Royan, Chte. Maritime (Pit-Head Gear); E. Müller, Zofingen, Switzerland (Observation Car); H. Neily, Middleton, Nova Scotia (Farm Wagon with Hay Rack); I. E. Morris, London, W.9 (Ocean Liner); J. North, Marlbrook, Nr. Bromsgrove (Eight-Wheeled Motor Lorry and a Three-Wheeler Truck); E. Oyler, N. Mitcham, Surrey (Salvage Boat); L. Rubio, Pares, Barcelona (Transporter); A. Patys, Mons (Army Tank); F. Payás, Barcelona (Model of a Bird); W. Pegum, Ballylongford, Co. Kerry (Railway Viaduct); A. Perroden, Saint Gervais, Orne (Aeroplane); G. Marco Piaggio, Genoa (Racing Seaplane); M. Piers, Salisbury, S. Rhodesia (Jib Crane); B. Piper, Hawhurst, Kent (Tipping Motor Lorry); D. Potter, Belfast (Battleship); P. Prost, Cannes, A.M., France (Slipway for Launching Yachts); A. de Ridder, Louvain (Automatic Elevator); J. Riet, Louviers (Escalator); A. Ringrose, Newgate, Limerick (Grinding Mill driven by Water-Wheel); H. Rüegger, Zofingen (Omnibus); T. Sanders, Knowsley, Lancs. (Cattle Truck); K. Schryer, Westboro, Ontario (Trench Digging Machine); B. Scott, Belfast (Tank fitted with Crawler Track); W. Sellman, Gisborne, N.Z. (Winder for Radio Coils); P. Selorieux, Paris (Electric Cars as seen in Paris); K. Shrewsbury, Coulsdon, Surrey (Clothes Washing Machine); Bruno Signorini, Perugia, Italy (Designing Machine); L. Slater, Lytham-St.-Annes (Jib Crane and Fire Truck); E. Smith, Vamaru, N.Z. (Tractor Road Grader); W. Stromeyer, Magdeburg, Germany (Tractor and Trailer); H. Tennant, Launceston (Toy Model, "The Playful Horse"); J. Tichon, Namur (Tractor fitted with Creeper Track); W. Tripmaker, Potsdam (Crane); J. Turbyne, Dirleton, East Lothian (Grandfather Clock); G. Turdy, Wembley (Crane); R. Verspreeuwen, Antwerp (Merry-Go-Round); Antonfrancesco Vicini, Faenza, Ravenna (Motor Lorry); H. Viebahn, W. Elberfeld (Motor Car Repair Station); J. Vignaud, Valencinnes (Gantry Crane); A. V. Vorde, Aalsmeer, Holland (Printing Machine); G. Walker, Chatteris, Cambs. (Steam Washer for Carrots); W. Wells, Kenton (Double-deck Omnibus); E. Williams, London, S.W.19 (Travelling Coffee Stall).

The following competitors in Section "E" each receive a Certificate of Merit

F. Adams, Knapsack, Cologne; A. Aikman, Shoreham-by-Sea; E. Aquilina, Misida, Malta; P. Bouliau, Madeleine-lez-Lille, Nord; L. Boureau, Paris; M. Brègier, Le Havre, Seine; N. Bryant, Southampton; D. Conning, Auckland, N.Z.; G. Cox, Bicester; R. Cuevas, Avilés, Asturias; W. Dann, Bedland, Bristol; F. Demoulin, Avignon, Vaucluse; C. Dunkley, Tettenhall, Wolverhampton; H. Duplessis, Lymington, Hants.; L. Harman, London, S.E.2; D. Hewitt, Carnalea, Co. Down; F. Holmes, Nottingham; D. Hopcraft, Deddington; Oxon, G. Hopstack, Gelsenkirchen, Germany; R. Lamarsalle, Villefranche; F. Lang, Münich; J. Ledley, Brisbane, Queensland; J. Le Roy, Dieppe, Seinne Inf.; J. Marc, Lyon, Rhône; G. Miln, Warrington; M. Montu, Levallois Perret, Seine; F. Nicosia, Milan; H. Nitzschke, Forst, N/L; G. Parkyn, Barnet; R. Pierrard, Albert, Somme; T. Pink, Stromness; A. Rafols, Barcelona; V. Ricci, Venice; H. and A. Sädler, Cologne; R. Savall, Font, Pontevedra; H. Schild, Hellenthal, Germany; W. Schmidt, Tangerhütte; J. Scowcroft, Cleveleys, Blackpool; O. Stadhalter, Odenkirchen; A. Stauffert, Strasbourg, Bas-Rhine; P. Wright, Reading.

Special Aeroplane Prizes

SECTION C:

First Prize (Tie), £5 divided between two competitors: Geoffrey T. Chapman, Fleetwood (Gotha Twin-Engined Bombing Aeroplane); German Sonntag, F.C.P., Buenos Aires (Avion Dornier Super-Wal Flying Boat). **Second Prize (Tie), £3 divided between two competitors:** L. C. van den Broek, The Hague, Holland (Fokker "*F.VIII*" Monoplane); Mario Prunas, Cagliari, Italy (Triple-Engined Monoplane). **Third Prize, Cheque for £1:** Pat Erskine-Tulloch, Oxted (Handley-Page "*Clive*" Troop Carrier).

SECTION D:

First Prize (Tie), £5 divided between two competitors: B. Rivron, Ipswich (Short "*Calcutta*" Flying Boat); Vittonio di Sambuy, Rome (Douglas "*Dolphin*," "*Spirit of St. Louis*" Monoplane, Biplane, and other Models). **Second Prize (Tie), £3 divided between two competitors:** Guy Bard, Bastogne, Prov. du Luxembourg (Triple-Engined Low Wing Monoplane); John Clemes, Blackburn ("*Bristol-Bulldog*" Aeroplane). **Third Prize, Cheque for £1:** François de Beauvais, Paris (Autogiro).

SECTION E:

First Prize (£5), divided between three competitors: F. Fenton, Manchester; H. Hutchinson, Barnard Castle; M. H. Orde, Chateau d'Oex, Switzerland. **Second Prize (£3), divided between three competitors:** W. Diggelman, Tossthal, Switzerland; C. E. Verguet, Chalon-sur-Saone, France; P. Zveteremich, Ivrea, Italy. **Third Prize (£1), divided between two competitors:** D. I. Cartwright, London, E.4; P. V. Jacobs, Goodmayes, Essex.

Meccano Twin Anti-Aircraft Guns

That may be Trained and Fired Like Real Guns

ONE of the latest forms of warfare is carried out by aeroplanes, and in order to combat this menace many methods of defence and counter-attack have been adopted. Counter-attacking is of course only possible by aeroplanes of equal or greater power than the attacking force, but for defence gun-fire has proved the most universally suitable method, and it is for this purpose that the anti-aircraft gun has been evolved. When gun-fire was first adopted the speed of aeroplanes was comparatively slow, thus enabling relatively slow gun-fire and manœuvring to be effective. As the speed of aircraft increased, however, the speed of operating the guns had to be increased proportionately, until to-day with the latest type of coastal defence guns an amazing rapidity of fire with remarkable accuracy is possible. By mounting two guns on one pedestal the rate of fire has been almost doubled, and in this manner also the possibility of a " hit " has been greatly increased. It is upon this latest pattern of twin mounted anti-aircraft guns that the design for the Meccano model has been based, and the result, as will be seen from Fig. 1 in this article, is a very imposing and " true to life " model.

Constructing the Meccano Model

Commence the model by constructing the guns, each of which is built up in the following manner. The barrel (Fig. 3) consists of an $18\frac{1}{2}''$ Angle Girder 1 to which is secured, by means of a $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket 3, a $12\frac{1}{2}''$ Angle Girder 2. The Angle Bracket 3 is drawn out to the extremity of its slotted hole on one side in order to allow a clear passage for the " shot." The $18\frac{1}{2}''$ Angle Girder 1 also carries a $2\frac{1}{2}''$ Girder 45, secured in place at its outer end by two Double Brackets. It will be noticed that the Girders 2 and 45 are coupled together along one side by means of two $5\frac{1}{2}''$ Strips.

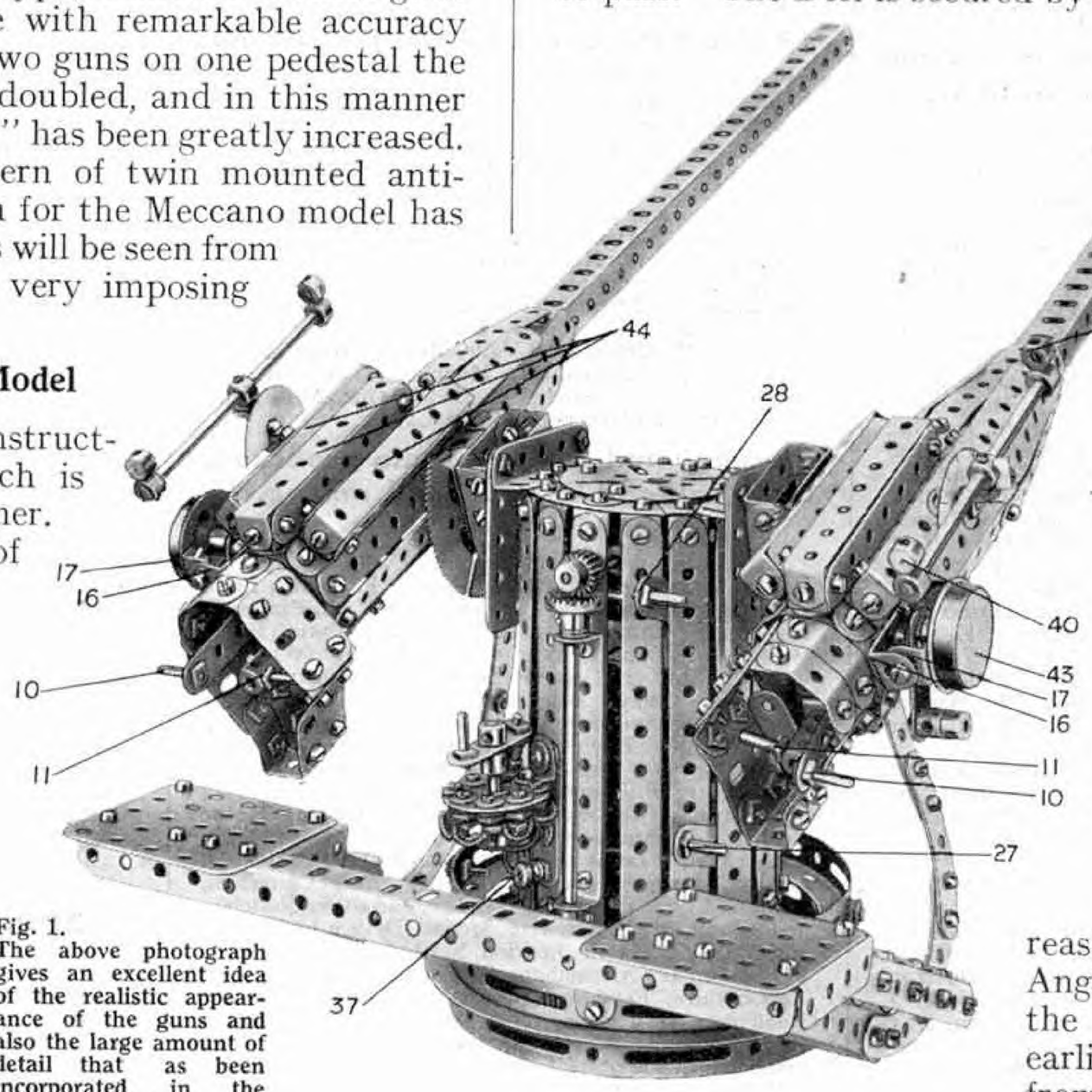


Fig. 1.
The above photograph gives an excellent idea of the realistic appearance of the guns and also the large amount of detail that as been incorporated in the model.

The actual barrel of the gun, consisting of an $11\frac{1}{2}''$ Rod 4, is attached to the outside casing by means of two Couplings, one of which is shown at 5. The other Coupling is not shown, but is secured by Bolts, entering its threaded holes, to the Girders 1 and 45. The Rod 4 carries a Collar next to the Coupling 5, and to this are attached three inter-locked Compression Springs. Three Double Brackets are bolted to the Girder 45 as shown in the photograph, and these carry a $6\frac{1}{2}''$ Rod, one end of which carries a handle 11 and the other end an End Bearing 7. This End Bearing carries a loosely mounted Flat Bracket on a Bolt between its two ends, and the Flat Bracket in turn is fitted with two rigidly secured $1'' \times \frac{1}{2}''$ Angle Brackets. The upper portions of these Angle Brackets are kept in permanent contact, by a piece of Spring Cord, with the filed-off end of the upper Rod, shown clearly in Fig. 2.

It will now be seen that on passing a Washer, representing the shell, down the Rod 4, and pulling the handle 11 towards the operator, the two $1'' \times \frac{1}{2}''$ Angle Brackets are forced downward until their two bent-out ends pass one on each side of the Rod 4 and press against the Washer. If the handle is pulled still farther the Washer is forced down the Rod against the pressure of the Compression Springs until it passes the end of a $\frac{3}{8}''$ Bolt 6, which is raised sufficiently to allow the Washer to pass. The Bolt is secured by an Angle Bracket to the handle 10. When the Compression Springs are fully compressed the Bolt 6 is lowered by raising the handle 10, the handle 11 then being returned to its original position. The Washer is now held only by the Bolt 6, and a slight pressure on the handle 10 is sufficient to release it. A little careful adjustment is necessary in order to allow the Washer free passage down the barrel of the gun, and for this reason the Bolt securing the Angle Bracket 3, and also the $5\frac{1}{2}''$ Strips mentioned earlier, are spaced away from their respective parts of the gun by Washers.

The broad part of the gun is shown clearly in Figs. 2 and 4, and is built up from alternate lengths of $7\frac{1}{2}''$ and $6\frac{1}{2}''$ Strips, the latter being composed of one $5\frac{1}{2}''$ and one $2\frac{1}{2}''$ Strip. Each length of strip is attached to its neighbour by means of two slightly bent Flat Brackets, one of which is placed at each end of the Strip. A gap, the width of one Strip, is left as shown in Fig. 2 and this allows sufficient space for the loading mechanism to be operated. When the mechanism is inserted the gap is bridged by the two $1\frac{1}{2}''$ Strips, one of which is shown at 9, Fig. 3, and the other in Fig. 2. The casing is attached to the gun barrel by means of a $\frac{3}{4}''$ Bolt 15 that passes through a hole in the Girder 1 and is secured in a threaded hole of the Coupling 5.

The dummy breech-block is now fitted to the gun, and

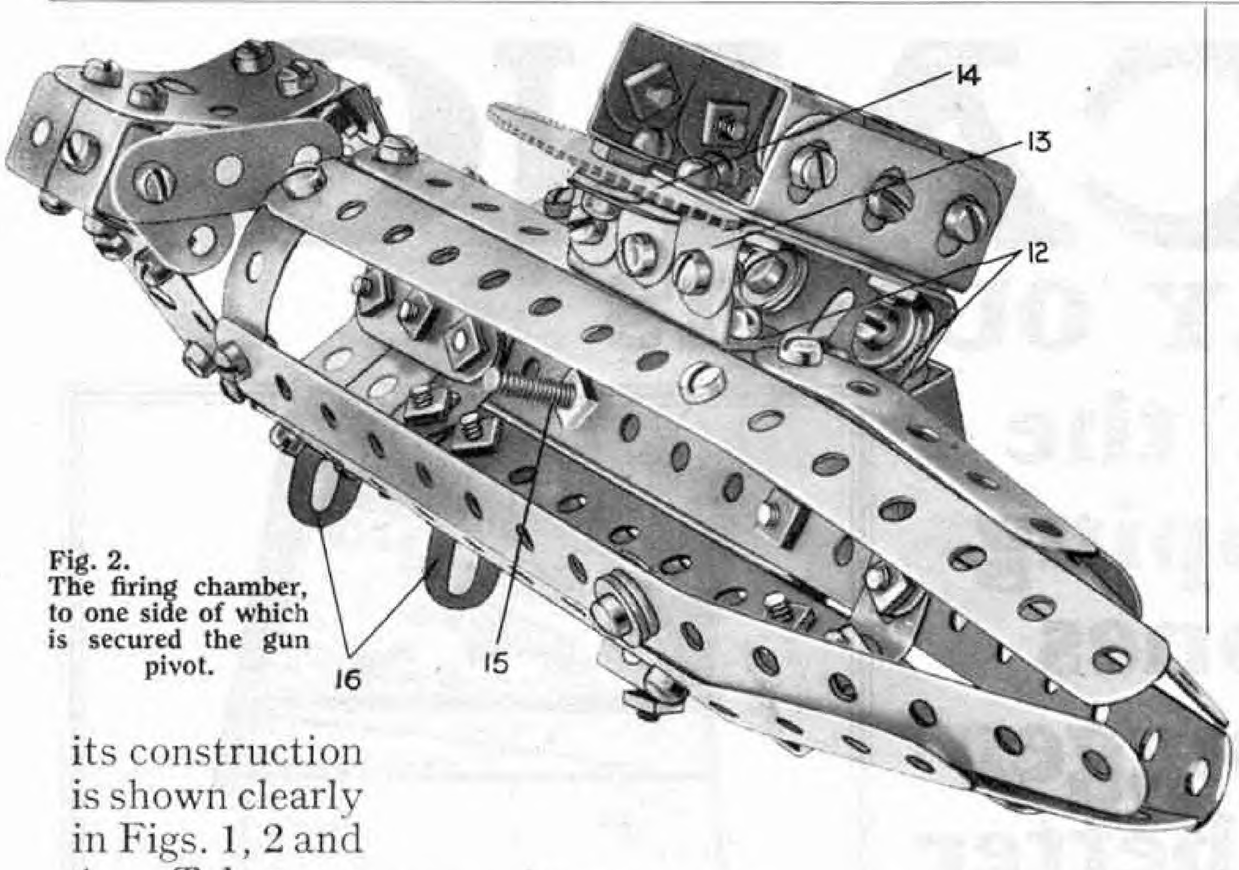


Fig. 2.
The firing chamber, to one side of which is secured the gun pivot.

its construction is shown clearly in Figs. 1, 2 and 4. Three dummy recoil cylinders 44 are also fitted, and each of these consists of a $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip bolted to the gun and surmounted by a further similar Double Angle Strip. The sides of each cylinder so formed are filled in by $3\frac{1}{2}''$ Strips bolted to Double Brackets.

The gun pivot (Fig. 2) consists of two $1\frac{1}{2}''$ Angle Girders 12, which are fitted with three $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips 13. These latter parts carry two Rack Segments 14 fitted edge to edge as shown, and are used for elevating and depressing the gun. Two further $1\frac{1}{2}''$ Angle Girders are mounted on the Double Angle Strips 13, and these carry three $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips that form the main turning surface of the gun.

When the two gun barrels are completed, the construction of the pedestal and power unit may be proceeded with, and for this part of the model Figs. 1, 5 and 6 will form useful references. The base consists of a Circular Plate on each side of which is fitted a Hub Disc. The upper Hub Disc is fitted with a Circular Girder, the necessary connection being made by four insulated Flat Brackets. A $3\frac{1}{2}''$ Gear Wheel 26 is secured to the base by means of eight $\frac{3}{8}''$ Bolts, two Washers being placed under the Gear Wheel on each Bolt for spacing purposes. A Ball Casing (part No. 168c) is shown in place on the $3\frac{1}{2}''$ Gear Wheel, and this supports a Flanged Disc (part No. 168a) that in turn carries a Face Plate 45. A circle of $2\frac{1}{2}''$ Small Radius Curved Strips, carrying $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets at every hole, is attached to this Face Plate by means of four Flat Brackets. Two $5\frac{1}{2}''$ Strips are bolted to two opposite of these Angle Brackets, and these Strips support a No. 6 Electric Motor, the necessary connections being made by $\frac{1}{2}''$ Bolts.

A $\frac{1}{2}''$ Pinion on the Motor armature shaft engages with a 57-teeth Gear 22. This Gear is mounted on a $2\frac{1}{2}''$ Rod that carries a Worm 23 engaging a $\frac{1}{2}''$ Pinion mounted on a sliding rod carrying at one end a $\frac{1}{2}''$ Pinion 24 and at the other a $\frac{1}{2}''$ Pinion 30, the lever 28 being fitted for engaging or disengaging these Pinions as required. The Pinion 24 drives, when desired, a $\frac{3}{4}''$ Contrate that is mounted on a vertical 5" Rod, the lower end of which carries a $\frac{3}{4}''$ Pinion 25.

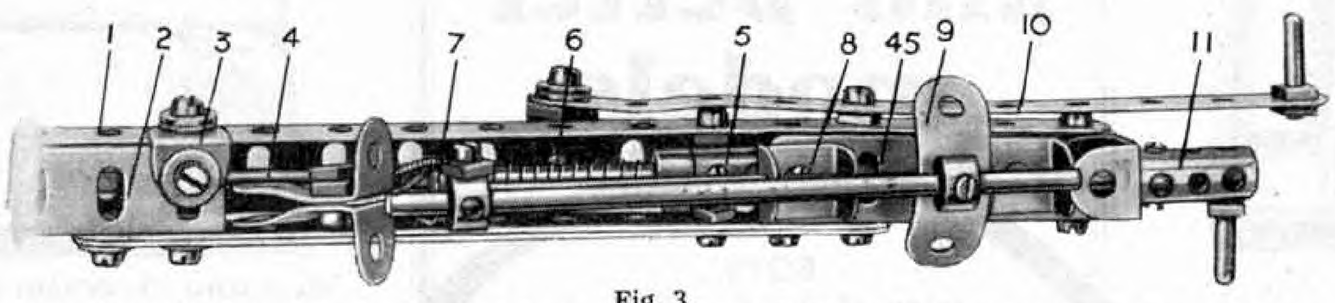


Fig. 3.
An underneath view of the loading and firing mechanism, in which both movements are clearly shown.

Before continuing with the remaining portion of the gear train, the pedestal must be completed in order to provide the necessary bearings for the drive. The two vertical $5\frac{1}{2}''$ Strips supporting the Motor carry at their top ends a second circle of $2\frac{1}{2}''$ Small Radius Curved Strips fitted with $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets in a similar manner to the lower circle. The work of building up the sides of the pedestal may now be carried out, and this consists of securing $5\frac{1}{2}''$ Strips between the two sets of Angle Brackets. The upper circle of Curved Strips carries at two opposite points, parallel to the Electric Motor side plates, two $2\frac{1}{2}''$ Angle Girders, each of which supports two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates forming the bearing surface for the gun pivot. The pivots for the guns consist of $\frac{3}{8}''$ Bolts 36. It will be seen from Fig. 6 that the front lower corners of the $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates carry Simple Bell Cranks fitted with Cranks.

The $\frac{1}{2}''$ Pinion 30 engages with a similar Pinion that is mounted on a $1\frac{1}{2}''$ Rod carrying the Worm 29. This Rod is journalled at its inner end in a $1'' \times 1''$ Angle Bracket secured to one of the side plates of the Electric Motor. The Worm 29 is in mesh with a $\frac{1}{2}''$ Pinion 31 that drives, through two $\frac{1}{2}''$ Pinions, a $\frac{1}{2}''$ diameter $\frac{1}{2}''$ face Pinion 32 on each side of the pedestal. The bearings carrying the Rod for the last stage of gearing are prevented from being distorted by a $3\frac{1}{2}''$ Rod secured in the boses of the Cranks mentioned earlier. The Pinions 32 are carried on 2" Threaded Rods, the ends of which will be used later for supporting the rear platform.

The guns may now be mounted, and this is accomplished in each case by passing the Bolt 36 through the centre hole of the centre Double Angle Strip on the gun pivoting face. The Bolt is then fitted with locknuts and, on swinging the gun about its pivot, the Rack Segments 14 will be found to engage their respective Pinions 32. The pedestal and guns may now be placed in position on the base, a $1\frac{1}{2}''$ Rod gripped in the base of the lower Face Plate 45 serving as a central pivot. This pivot passes through the boss of the Gear 26 and is held in place on the underside by means of a Collar.

A small platform consisting of a $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plate is fitted to the front of the pedestal by means of two $1'' \times 1''$ Angle Brackets. The rear of the pedestal also carries a platform, the construction of which is shown clearly in Figs. 1 and 6; and this platform is attached to the model by means of the Threaded Rods carrying the Pinions 32.

The electrical equipment of the model consists of a

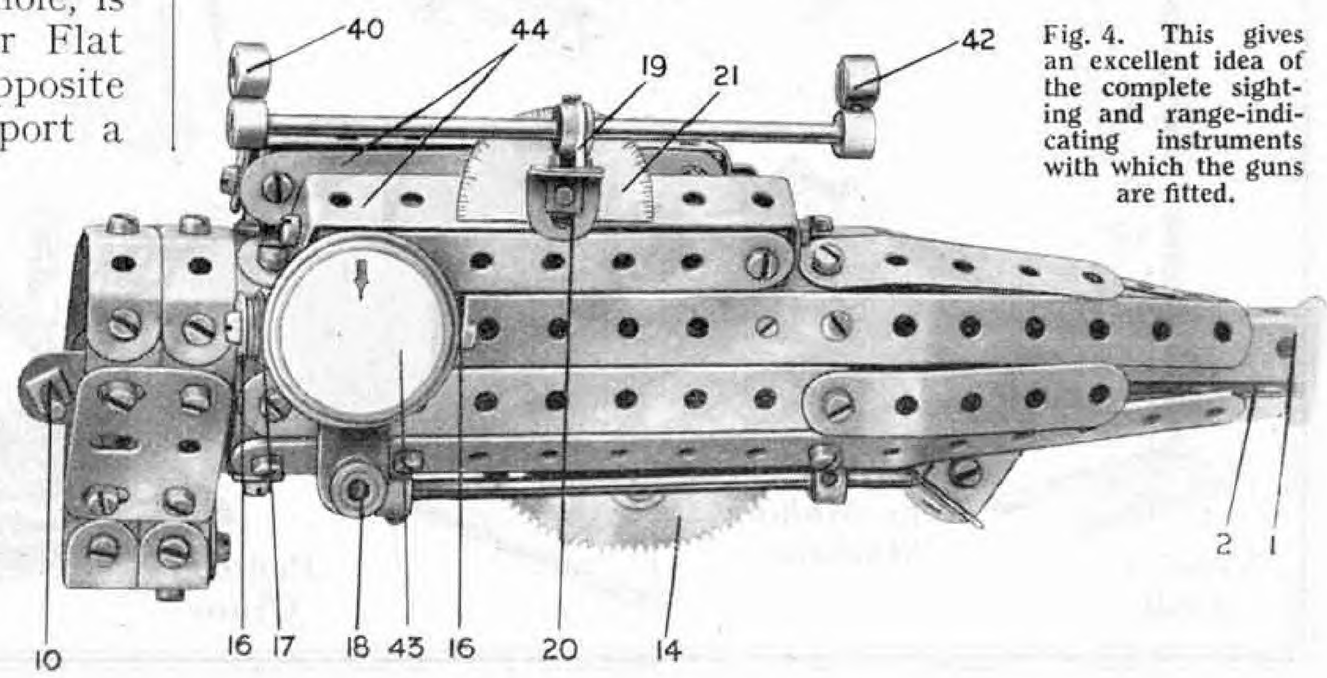


Fig. 4. This gives an excellent idea of the complete sighting and range-indicating instruments with which the guns are fitted.

MECCANO

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Meccano Accessory Outfit No. 3a

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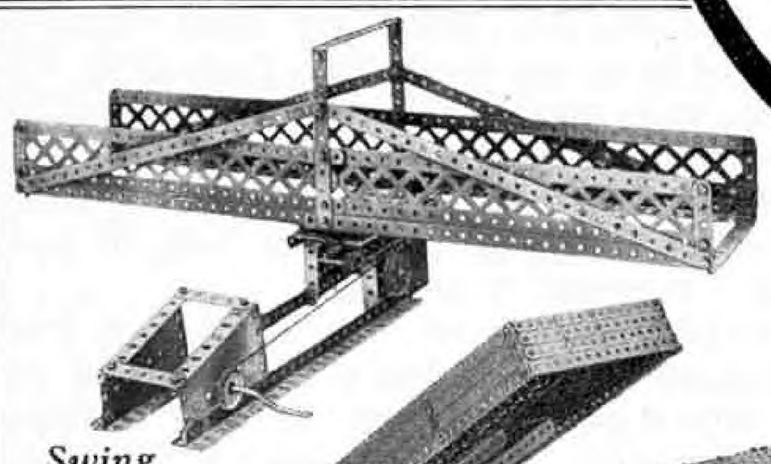
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No. 00a converts a No. 00 Outfit into a No. 0	1/6
No. 0a converts a No. 0 Outfit into a No. 1	5/6
No. 1a converts a No. 1 Outfit into a No. 2	7/-
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No. 3a converts a No. 3 Outfit into a No. 4	26/-

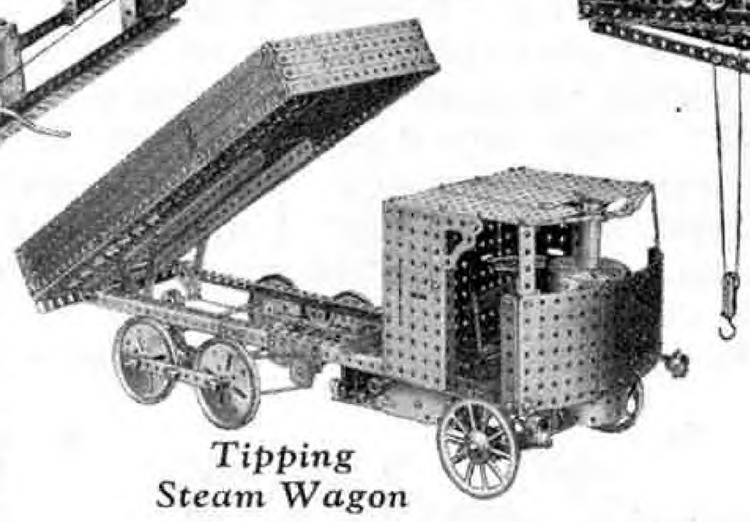
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No. 5a† converts a No. 5 Outfit into a No. 6†	97/6
No. 6a† converts a No. 6 Outfit into a No. 7	235/-

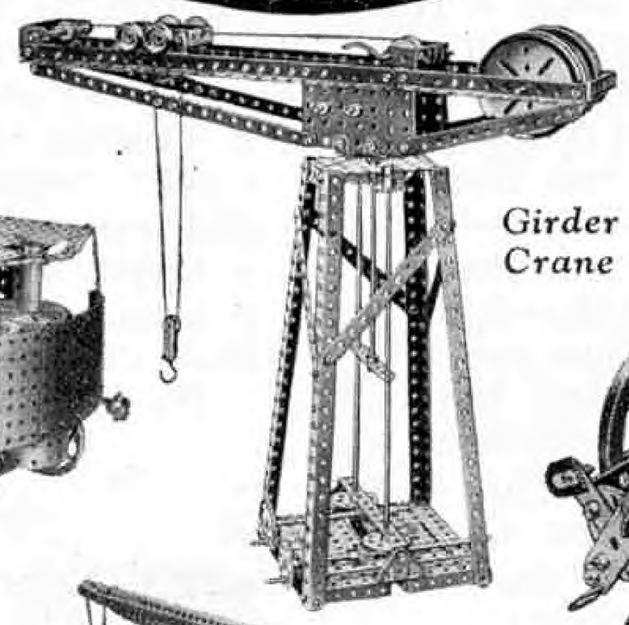
* Carton. † Enamelled cabinet.



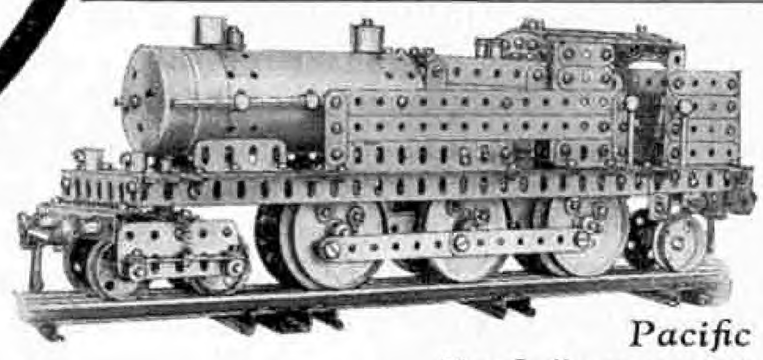
Swing Bridge



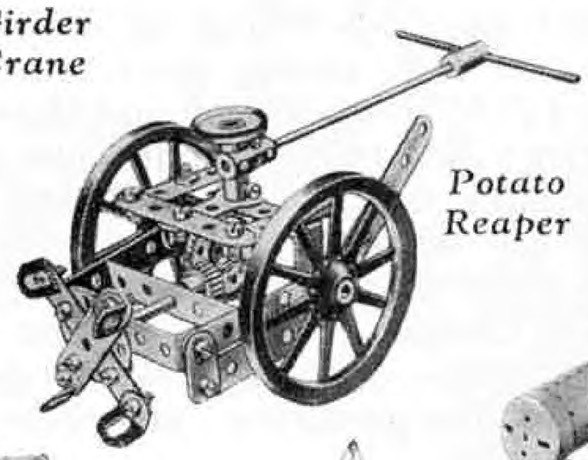
Tipping Steam Wagon



Girder Crane



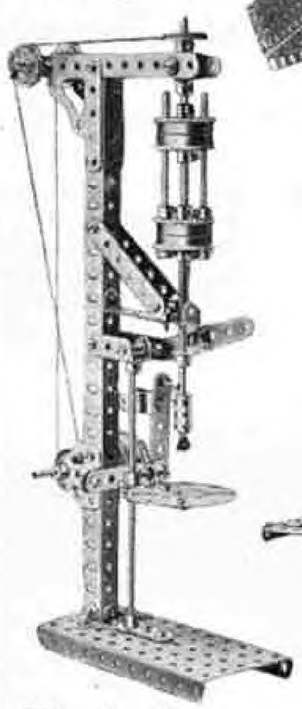
Pacific Tank Locomotive



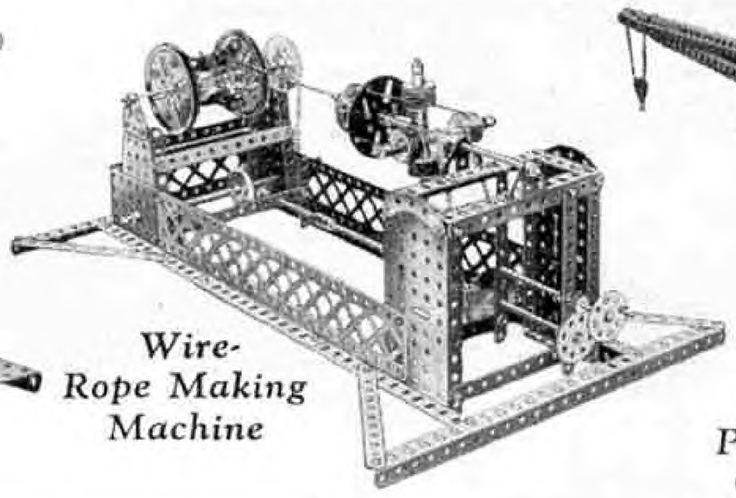
Potato Reaper



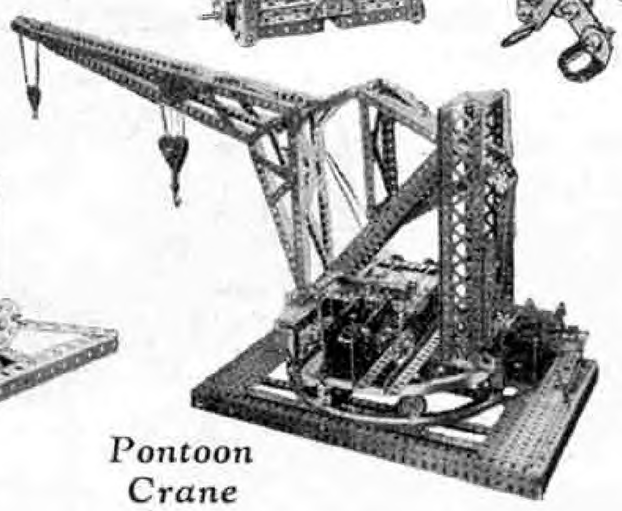
Vertical Marine Engine



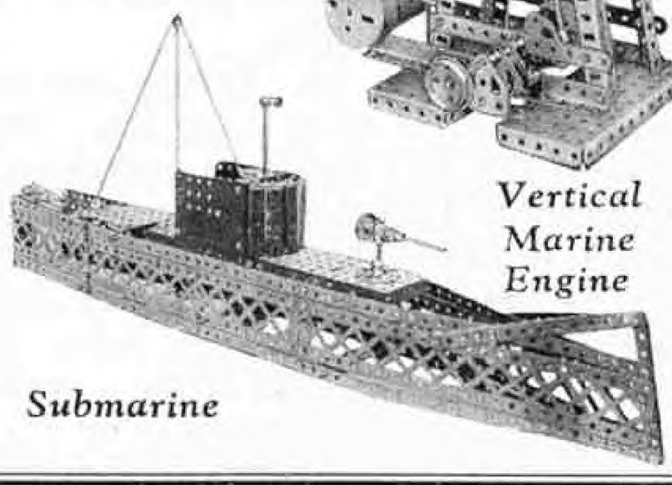
Vertical Drill



Wire-Rope Making Machine



Pontoon Crane



Submarine

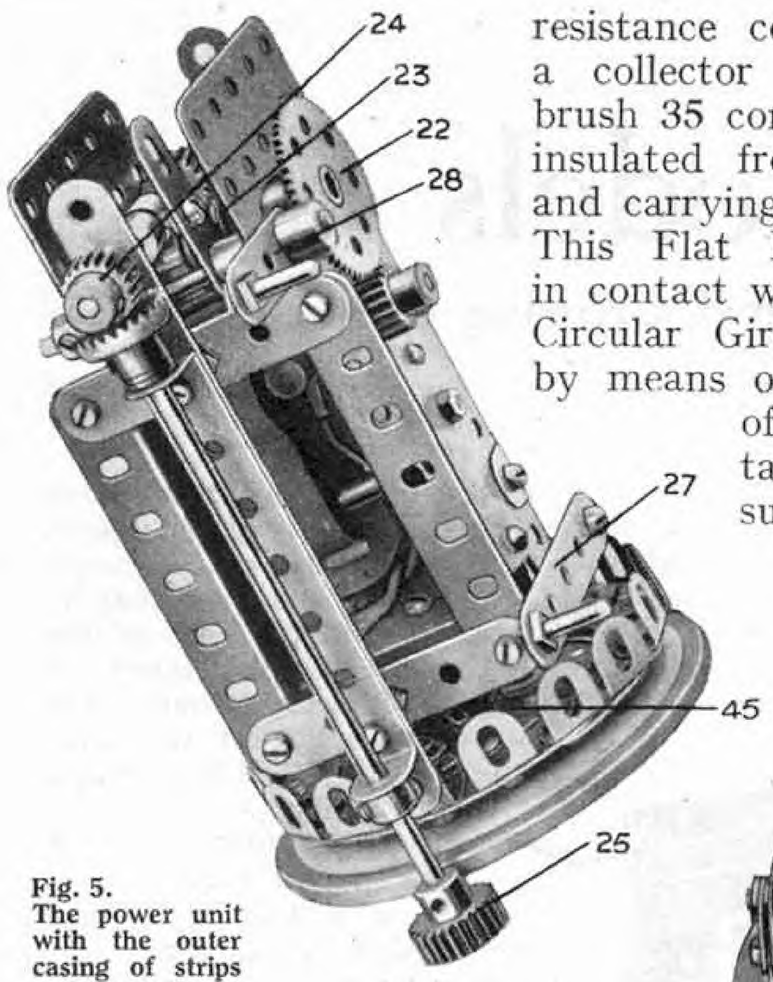
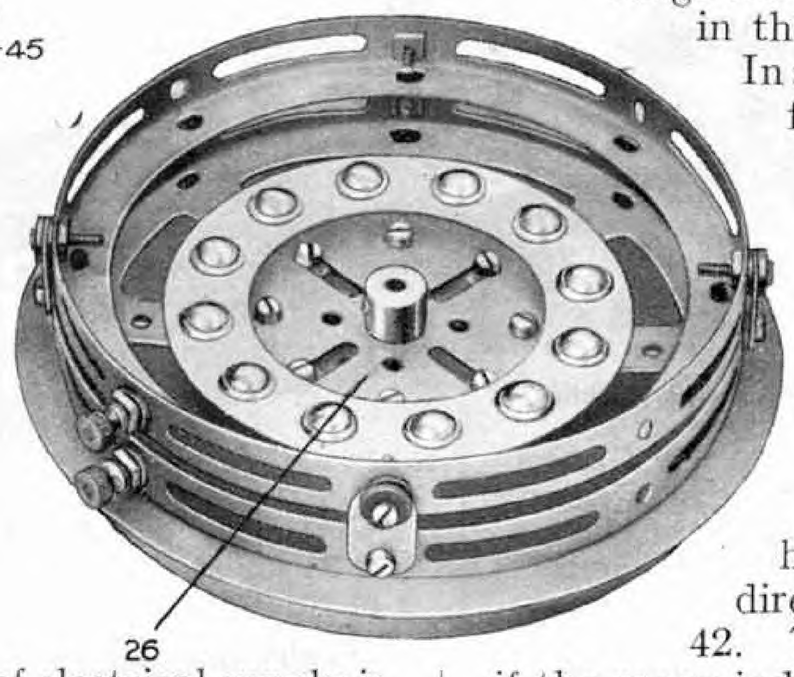


Fig. 5.
The power unit with the outer casing of strips removed.

resistance controller 34 and a collector brush 35. The brush 35 consists of a Hinge insulated from the pedestal and carrying a Flat Bracket. This Flat Bracket is kept in contact with the insulated Circular Girder of the base by means of a short length of Spring Cord attached to, but insulated from, the Flat Bracket. The resistance controller is attached to the pedestal by means of a $\frac{1}{2}'' \times \frac{1}{2}''$ and a $1'' \times 1''$ Angle Bracket, and its construction is similar in every respect to Standard Mechanism No. 115. One lead from the source of electrical supply is connected to an earth terminal, and the other lead is connected to a terminal that is in contact with the insulated Circular Girder. The current passes from this Girder to the collector shoe 35, from where it passes to one side of the resistance controller 34. The remaining terminal on the controller is then connected to one terminal of the Electric Motor, the other Motor terminal being earthed. Thus in all positions of the guns a supply of current is passing to the Motor, and this may be controlled by the rheostat 34. The Motor is started or reversed by means of the lever 27, protruding through the pedestal casing as shown in Fig. 1; and complete control over the guns is obtained from the lever 28.



Probably the most interesting part of the model is the sighting and range-indicating apparatus, for this has been constructed on similar lines to that fitted to actual guns. It will be noticed that this apparatus is fitted to both guns, but this is really unnecessary, except when the guns are used separately.

The sight of each gun consists of a $4\frac{1}{2}''$ Rod, fitted at each end with two Collars 40 and 42, and mounted centrally in a Collar 19. Each set of Collars 40 and 42 are joined together by means of a Grub Screw, half of which is passed into each Collar. The Collar 42 has a vertical thin piece of wire gummed across it, and 40 is fitted with a small piece of tinfoil, the centre of which is pierced with a pin. The Collar 19 is locknutted to a $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket 20, which in turn is locknutted to a similar Angle Bracket on one of the recoil cylinders. These locknuts must not be too loosely fitted, as this would impair the working of the apparatus. A scale for reading the lateral movement of the sight is fitted to the Collar 19 and to the Angle Bracket 20, and a semi-circular scale 21 is fitted for indicating the vertical movement.

The range indicator consists of a large Flanged Wheel carrying a Pivot Bolt in its boss, on the head of which is gummed a circle of thin cardboard. A Crank, the boss of which is fitted with a Collar, is locked securely on to the outer threaded shank of the Pivot Bolt, and the weighted lever so formed always ensures that the inner cardboard disc remains in the same position relative to the surface of the earth. The slotted circle of cardboard 43 is gummed on to the rim of the Flanged Wheel. Thus when the gun is elevated or depressed, the ranges appear through the slot in the card 43, and in this manner quick and accurate shooting may be obtained if the distance between the gun and the object of attention is known. In order to obtain the last-mentioned information it is necessary to use a range-finder, an excellent model of which appeared in the "*M.M.*" for August 1931.

In shooting, the operation of the model is as follows. If the range is 40 ft., the guns are elevated until 40 appears in the range indicator slot, and the sight is moved inward slightly so that the line of vision converges with the line of fire. The sight may now be moved vertically without interfering with the loading of the guns, and the guns are then rotated until, on looking through the hole at 40, the object of attention appears directly in front of the vertical line at 42. The gun is now ready for firing, and if the range indicator and sighting apparatus have been graduated correctly, a "bull's eye" will be scored.

After a little practice great speed and accuracy of fire will be possible with these guns and, as in actual practice, the twin barrels will be found to make a remarkable percentage of "hits" possible. It is advisable to smear the washers, forming the shells, with a little thin oil before loading them into the guns for the first few shots, as this enables a smooth surface to be formed on the inside of the gun barrels.

In order to reduce friction to a minimum, oil in sufficient quantities, must be applied to all mechanical parts of the guns and also to the pivot faces and care must be taken to see that the Brush 35 is always in good contact with its Circular Girder. If these few points are carried out, little or no mechanical trouble will be experienced with the model, and its construction and use will give many hours of entertainment and fun.

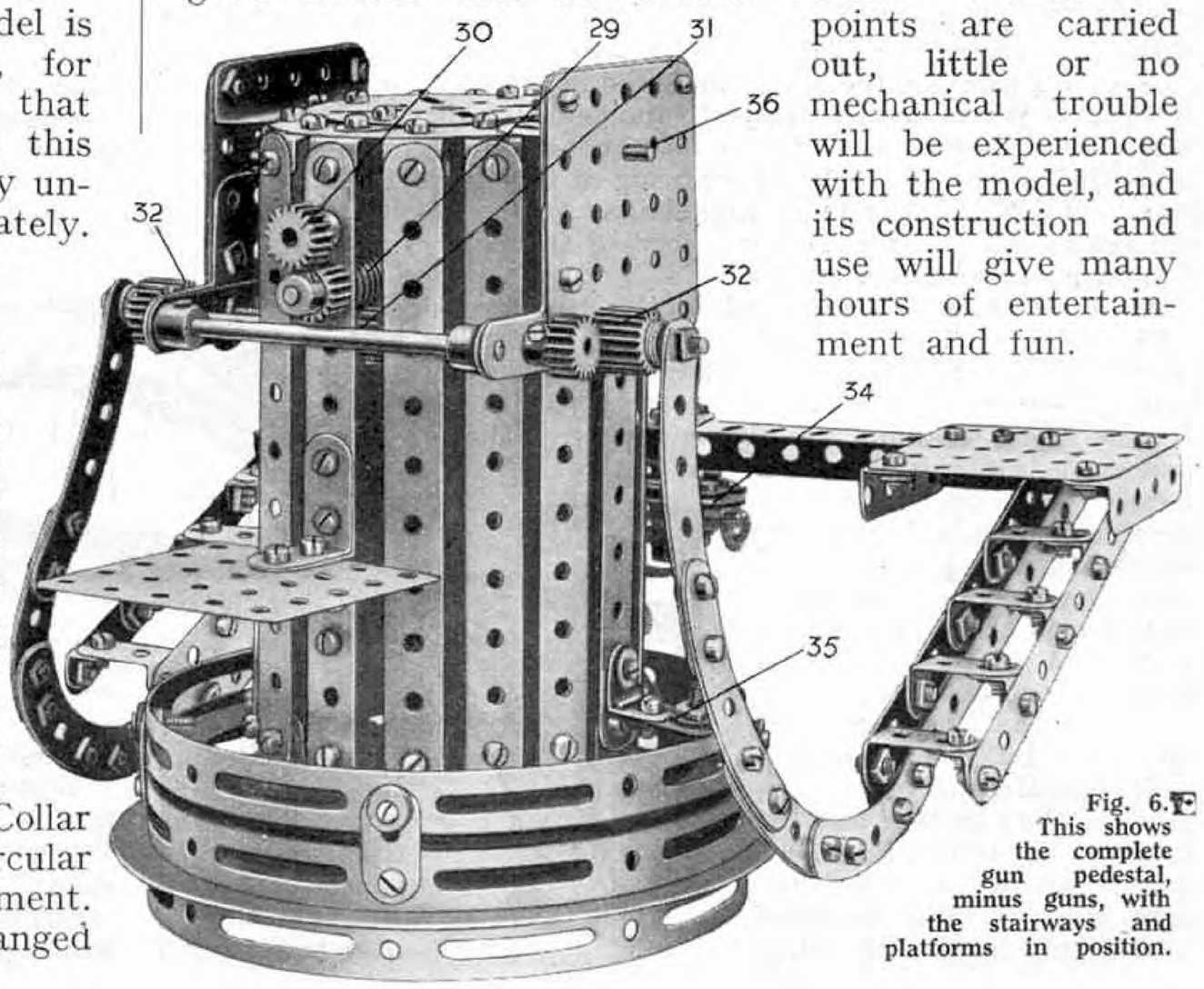


Fig. 6.
This shows the complete gun pedestal, minus guns, with the stairways and platforms in position.

New Meccano Models

Wire Coverer—Arch Bridge—Crane—Meccanograph—Level Crossing Gates, etc.

ONE of the most remarkable features of Meccano model-building is the extraordinarily wide range of machines and structures of which faithful reproductions may be made, even with small Outfits, and the interest of the hobby makes it a source of almost unlimited pleasure. The new models described this month illustrate this wonderful variety, and also show how model-building encourages invention and gives opportunities for the introduction of ingenious ideas in overcoming little difficulties met with in construction.

Wire Covering Machine

The model shown in Fig. 1 is a machine that enables a coil of bare wire to be covered with a layer of cotton thread, thus converting the bare wire into the covered insulating type.

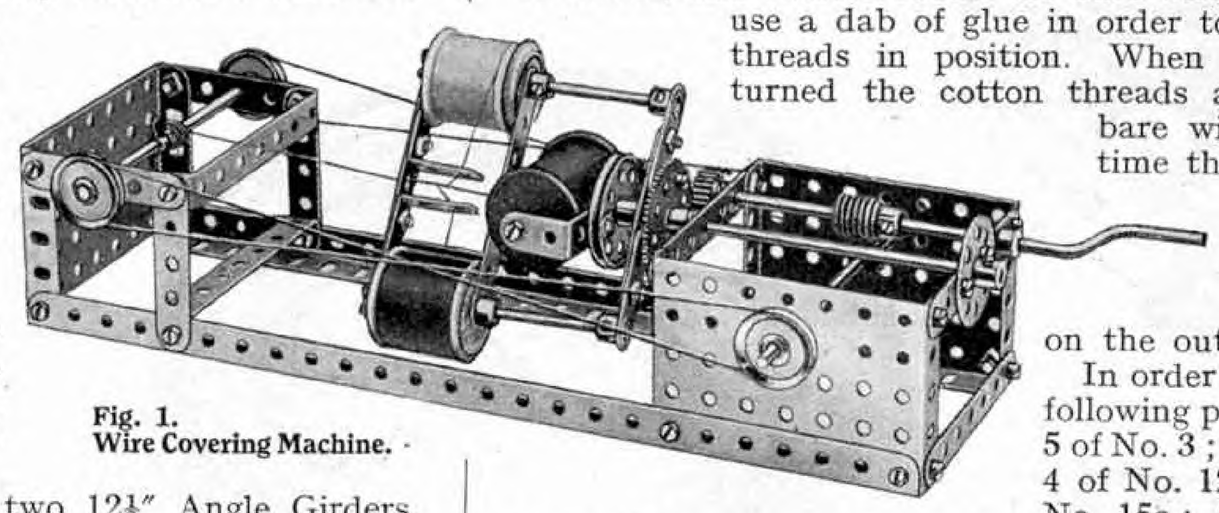


Fig. 1. Wire Covering Machine.

The frame of the model consists of two 12½″ Angle Girders spaced apart by 3½″ × ½″ Double Angle Strips. A 3½″ × 2½″ Flanged Plate is bolted in position at one end of the model and two similar Plates are secured to the side Girders at the other end of the frame. Two 3½″ Strips are bolted between these Plates so as to form a frame in which the gearing may be secured. A 3½″ × ½″ Double Angle Strip is supported in position close to one end of the frame by means of four 3½″ Strips, and a 4½″ Axle Rod is mounted in the frame so formed. This Axle Rod forms the drum on to which the wire that has been covered is wound. Two 1″ Fast Pulleys are secured on this Rod and serve to couple it to the operating handle of the model, thus enabling the take-up action to be carried out. A 4½″ Axle is mounted rigidly in the boss of a Bush Wheel that is secured to one of the 3½″ Strips forming the gear-box. A 57-teeth Gear Wheel is mounted loosely on this Rod, and a 2½″ Strip carrying a Crank at each end is attached to the Gear Wheel, being spaced away from its face by means of Washers. An Axle Rod is mounted in the boss of each Crank and the bobbins carrying the cotton thread are mounted on these Axles.

The bobbins are prevented from sliding up and down the Rod by means of two 3½″ Strips held in position by means of Collars and Spring Clips. The front 3½″ Strip also carries two 1″ × 1″ Angle Brackets, and the holes in the lugs of these Brackets form guides through which the cotton threads are led on to the wire that is to be covered. The Bobbin carrying the wire is mounted in a holder composed of a 1½″ Pulley Wheel bolted rigidly to the central axle. Two 1″ × 1″ Angle Brackets are bolted to the face of the Pulley, and a ½″ Bolt is secured in the end holes of each lug of the Angle Brackets by means of a Nut. The projecting shanks of these Bolts pass into the centre bore of the bobbin carrying the bare wire, and the bobbin is thus held in place.

A Crank Handle is mounted in the gear-box, and a ½″ Pinion is secured on one end. This Pinion meshes with the 57-teeth Gear carrying the frame on which the thread bobbins are mounted, and by rotating the Crank Handle these bobbins are driven round. The take-up action is effected by means of a Worm mounted on the Crank Handle shaft which meshes with a ½″ Pinion secured on a transverse shaft mounted in the gear-box side plates. A 1″ Fast Pulley is mounted on each end of this Rod, and the Rod is coupled up drum by means of two

To operate the model, the carrying the bare wire and the threads (which may be of two colours) are placed in position, bare wire is then threaded centre hole in the 3½″ Strip to the take- crossed belts. bobbins cotton distinctive and the through the attached to the rotating frame, the end of the wire being anchored to the take-up axle by means of a Spring Clip. The ends of the cotton threads are then led through the holes in the lugs of the Angle Brackets, and twisted round the bare wire. It is a good plan to use a dab of glue in order to hold the ends of the threads in position. When the Crank Handle is turned the cotton threads are twisted round the bare wire, while at the same time the wire is slowly drawn from the Bobbin on to the take-up drum. In this way a layer of cotton is formed on the outside of the wire.

In order to build this model the following parts will be required :— 5 of No. 3 ; 5 of No. 5 ; 2 of No. 8 ; 4 of No. 12a ; 2 of No. 15 ; 1 of No. 15a ; 2 of No. 16 ; 1 of No. 19 ; 1 of No. 21 ; 4 of No. 22 ; 1 of No. 24 ; 2 of No. 26 ; 1 of No. 27a ; 1 of No. 32 ; 5 of No. 35 ; 26 of No. 37 ; 4 of No. 37a ; 6 of No. 38 ; 1 of No. 40 ; 2 of No. 48b ; 3 of No. 53 ; 4 of No. 59 ; 2 of No. 62 ; 2 of No. 111 ; 2 of No. 111c.

Centrifugal Governor

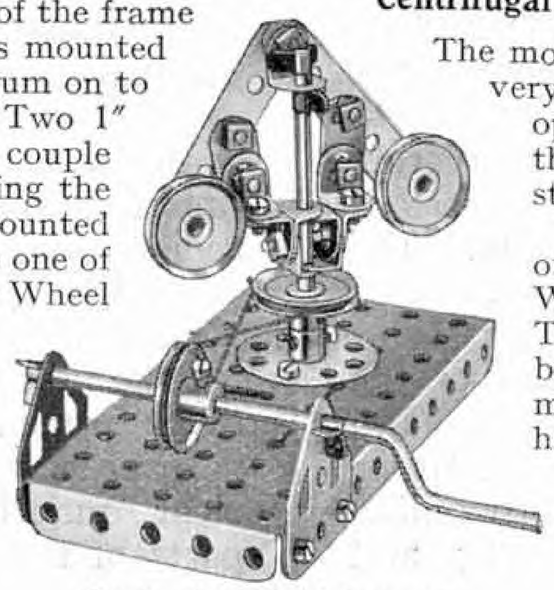


Fig. 2. Centrifugal Governor.

The model Centrifugal Governor shown in Fig. 2, although very simple, will be found interesting to build and operate, as it demonstrates the principle on which the governors fitted to the majority of stationary steam engines operate.

A 5½″ × 2½″ Flanged Plate is used as the base plate of the model, and two Flat Trunnions and a Bush Wheel are secured in the positions shown in Fig. 2. The Bush Wheel forms a vertical or "foot-step" bearing for the Axle Rod carrying the governing mechanism. The governor arms consist of 2½″ Strips having 1″ Fast Pulleys attached to their ends to provide the necessary weights. The Pulleys are held in position by means of Bolts that are passed through the end perforations in the Strips into the bosses of the Pulleys, where they are gripped by the Set Screws.

The upper ends of the 2½″ Strips are pivotally connected to an Angle Bracket by means of a Bolt and two locknuts. The Angle Bracket is held in place on the vertical Axle by means of two Spring Clips, one Clip being placed with its "wings" engaging with the outer locknut of the pivot, so that the Bracket will turn at the same time as the Rod.

A Flat Bracket is pivotally secured to each governor arm by means of a Bolt and two locknuts, and an Angle Bracket is attached to each of the Flat Brackets by further Bolts and locknuts. A second pair of Angle Brackets are now bolted to those already in position, and these are secured to two Double Brackets that are free to slide up and down on the vertical axle. A 1″ Fast Pulley is secured rigidly to the vertical Axle and this Pulley is coupled to a second 1″ Pulley mounted on a Crank Handle by means of a crossed belt. The vertical Rod is pre- ing upward by means of a on the Rod against the base plate.

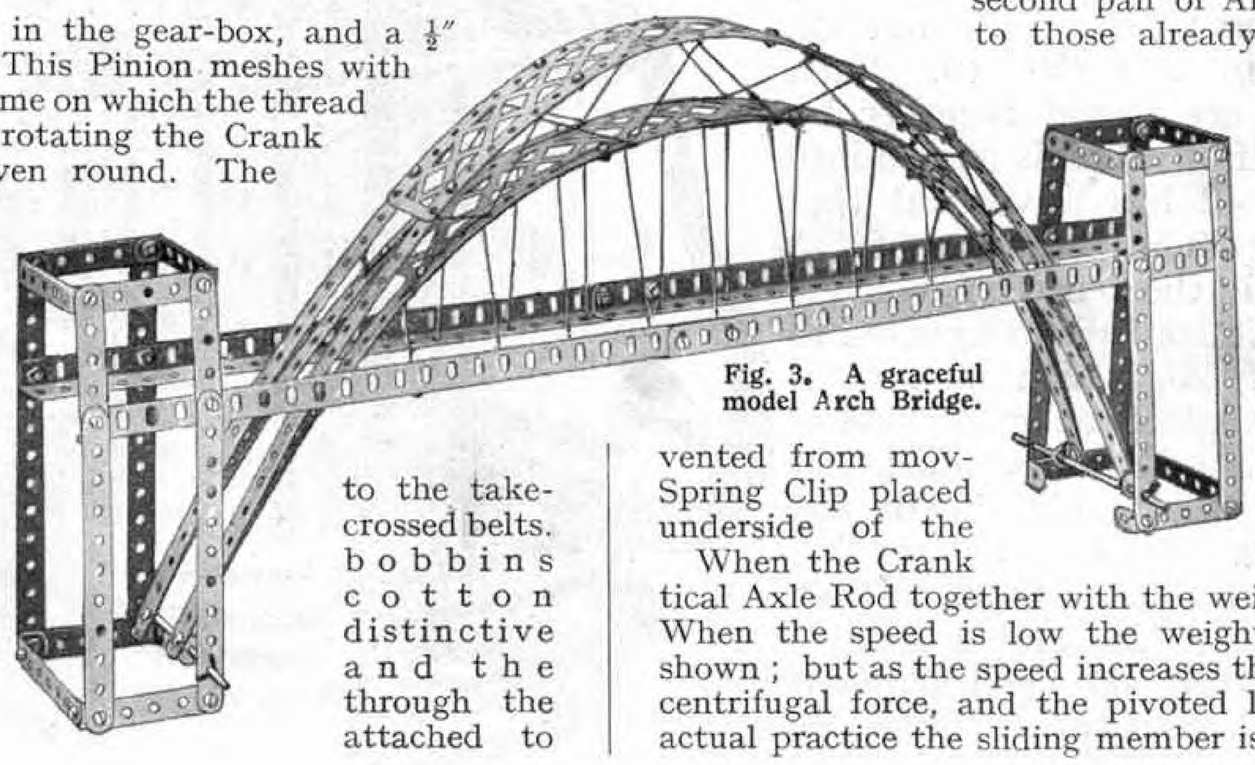


Fig. 3. A graceful model Arch Bridge.

vented from mov- Spring Clip placed underside of the

When the Crank Handle is rotated, the vertical Axle Rod together with the weighted arms are driven round. When the speed is low the weighted arms keep the positions shown ; but as the speed increases the weights fly outward, due to centrifugal force, and the pivoted links are drawn upward. In actual practice the sliding member is connected to the steam inlet

valve of the engine, and matters are arranged so that as the sliding member rises the supply of steam is reduced. In this manner the speed of the engine is kept constant.

The parts that are required in the construction of the Governor are as follows :—2 of No. 5 ; 2 of No. 10 ; 2 of No. 11 ; 5 of No. 12 ; 1 of No. 16 ; 1 of No. 19s ; 3 of No. 22 ; 1 of No. 24 ; 5 of No. 35 ; 17 of No. 37 ; 3 of No. 37a ; 1 of No. 52 ; 2 of No. 126a.

Arch Bridge

Among the many types of bridges that are erected in all parts of the world none gives a more wonderful impression of grace and strength than the arch bridge. The most famous example of this type is the recently completed Sydney Harbour Bridge.

The model shown in Fig. 3 uses few parts, but in spite of this a close resemblance to the arch type bridge has been obtained. The anchorage towers of the model are built from $5\frac{1}{2}''$ and $2\frac{1}{2}''$ Strips spaced apart by $3\frac{1}{2}'' \times \frac{1}{2}''$ and $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips so as to provide a slightly tapered structure.

Two compound Girders, each composed of two $12\frac{1}{2}''$ Angle Girders, are secured between the towers, as can be seen in the illustration. A $4\frac{1}{2}''$ Axle Rod is placed in position in the base of each tower, and two Angle Brackets are slipped on to each Axle Rod, the ends of the arch members being anchored to these Brackets.

The arch itself is built up from eight $12\frac{1}{2}''$ Strips and two $12\frac{1}{2}''$ Braced Girders. The Braced Girders are interconnected by lengths of Cord that are threaded between the Girders in zig-zag manner. Lengths of Cord are also secured in vertical positions between the lower portions of the arch and the road-way Girders to represent the suspension members.

To add the finishing touch to this model a strip of stiff cardboard should be cut to size and bolted in position between the Girders, to represent the roadway.

The arch bridge contains the following parts :—8 of No. 1 ; 8 of No. 2 ; 2 of No. 3 ; 12 of No. 5 ; 4 of No. 8 ; 4 of No. 12 ; 2 of No. 15 ; 8 of No. 35 ; 52 of No. 37 ; 8 of No. 38 ; 1 of No. 40 ; 8 of No. 48a ; 2 of No. 99.

Hammerhead Crane

The Hammerhead Crane (Super Model No. 29) is one of the most popular cranes in the Super Model series. The model is of course a very large one, and model-builders who wish to build a smaller and simpler version of this type of crane will be interested in the example shown in Fig. 4. This model incorporates two separate motions, hoisting of the crane block and travelling of the crane block trolley. The boom of the crane can also be slewed, but this action must be carried out by hand.

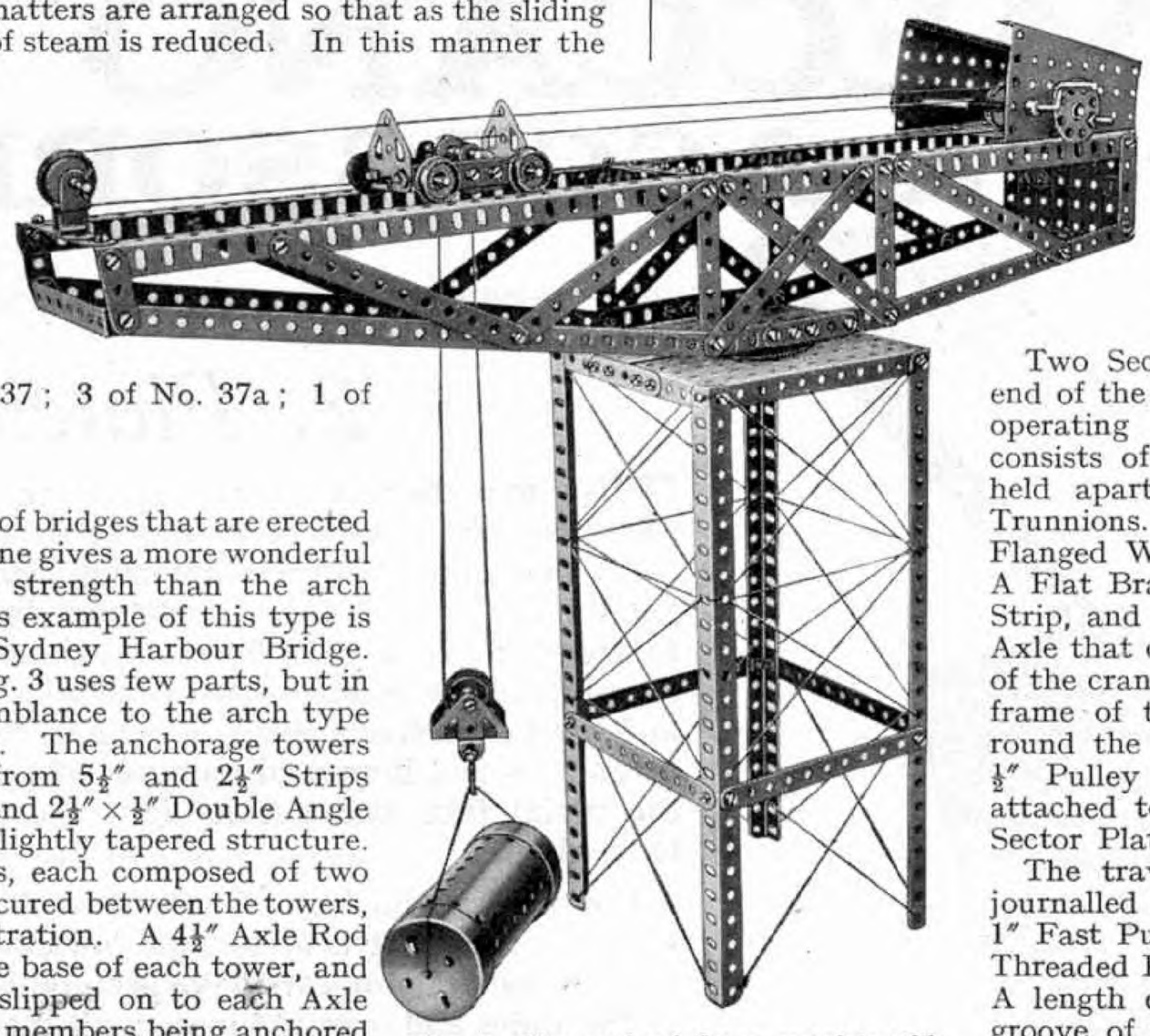


Fig. 4. Hammerhead Crane complete with crane block traveller and hoist motion.

The vertical standard on which the boom of the crane rests is built up as follows. The top platform consists of two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plates spaced half an inch apart by means of two $2\frac{1}{2}''$ Strips, one of which can be seen bolted to the side flanges of the Plates. Four $12\frac{1}{2}''$ Angle Girders are secured at the corners of the Flanged Plates, and these Angle Girders are spaced apart at the base by means of $5\frac{1}{2}''$ Strips, Cord bracing being arranged between the Girders as shown in the illustration.

A 3″ Pulley is mounted boss downward on the Flanged Plates, the boss passing into the space between the Flanged Plates. The boom of the crane is built up from $12\frac{1}{2}''$ Angle Girders and $12\frac{1}{2}''$ and $5\frac{1}{2}''$ Strips. A $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate is bolted in position on the lower portion of the boom, and this Plate rests on the 3″ Pulley secured to the fixed base. A $\frac{3}{8}''$ Bolt is passed through the centre hole of the Flanged Plate and is gripped in the boss of the 3″ Pulley. In this way the boom may be swivelled about the fixed base.

Two Sector Plates are secured to the rear end of the boom and provide supports for the operating Rods. The crane block trolley consists of two $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips held apart at each end by means of Flat Trunnions. The trolley is fitted with four $\frac{3}{4}''$ Flanged Wheels mounted on $3\frac{1}{2}''$ Axle Rods. A Flat Bracket is secured to each side Angle Strip, and these Brackets serve to support an Axle that carries a $\frac{1}{2}''$ Loose Pulley. One end of the crane block hoist cord is attached to the frame of the trolley, while the other passes round the crane block sheave and round the $\frac{1}{2}''$ Pulley on the trolley, afterwards being attached to a Crank Handle mounted in the Sector Plate at the rear of the boom.

The travelling motion consists of a shaft journalled in the Sector Plates and carrying a 1″ Fast Pulley and a Bush Wheel fitted with Threaded Pin, which thus forms a hand wheel. A length of Cord is wound twice round the groove of the 1″ Pulley and one end of the Cord is tied to the trolley. The other end is passed round a 1″ Pulley mounted in a Cranked Bent Strip at the front end of the boom, and is then tied to the trolley. Rotation of the Bush Wheel fitted with Threaded Pin will cause the trolley to be drawn either forward or backward along the top of the boom.

This Meccano Hammerhead Crane contains the following parts :—2 of No. 1 ; 16 of No. 2 ; 4 of No. 3 ; 2 of No. 4 ; 12 of No. 5 ; 2 of No. 6a ; 8 of No. 8 ; 4 of No. 10 ; 1 of No. 12 ; 1 of No. 15a ; 2 of No. 16 ; 1 of No. 17 ; 2 of No. 18a ; 1 of No. 19 ; 1 of No. 19b ; 4 of No. 20b ; 4 of No. 22 ; 1 of No. 23 ; 1 of No. 24 ; 7 of No. 35 ; 94 of No. 37 ; 4 of No. 38 ; 1 of No. 40 ; 1 of No. 44 ; 1 of No. 48 ; 7 of No. 48a ; 2 of No. 48b ; 2 of No. 52 ; 3 of No. 53 ; 2 of No. 54 ; 1 of No. 57 ; 3 of No. 59 ; 1 of No. 90a ; 1 of No. 111 ; 1 of No. 115 ; 2 of No. 126 ; 2 of No. 126a ; 1 of No. 162.

A Simple Meccanograph

Most Meccano boys will be familiar with the Meccanograph that forms the subject of Super Model No. 13. This machine enables a wide variety of artistic designs to be produced merely by turning a handle, and it is possible to obtain hours of enjoyment from the machine. In Fig. 5 is shown a small edition of the Meccanograph, from which a large number of interesting designs may be produced.

The frame of the model consists of four $12\frac{1}{2}''$ Angle Girders and a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate is bolted in position at each end of the frame. The carriage on which the pencil arm pivots is built up from a $5\frac{1}{2}''$ Strip, two Flat Trunnions and two $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. The carriage is mounted on guides consisting of Axle Rods secured in Angle Brackets bolted to the frame. The pencil arm consists of a $12\frac{1}{2}''$ Strip fitted with a Cranked Bent Strip at one end, and the pencil is placed in this Strip and held in position by means of a small elastic band 1. The pencil arm is pivoted on an Axle Rod secured in the boss of a Crank that is bolted to the carriage. The Strip is mounted between a 1″ Fast Pulley and a $\frac{3}{4}''$ Flanged Wheel, and by removing the Flanged Wheel and altering the pivoting point of the Strip, the designs may be varied.

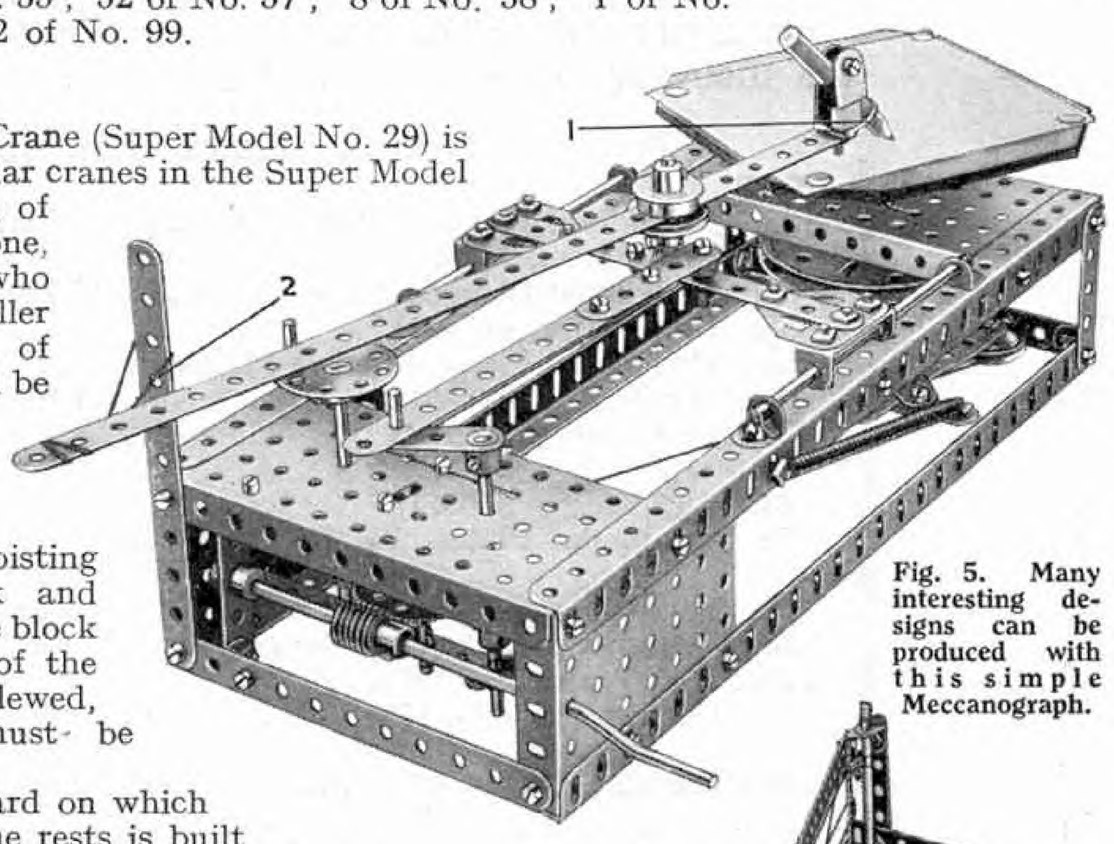


Fig. 5. Many interesting designs can be produced with this simple Meccanograph.

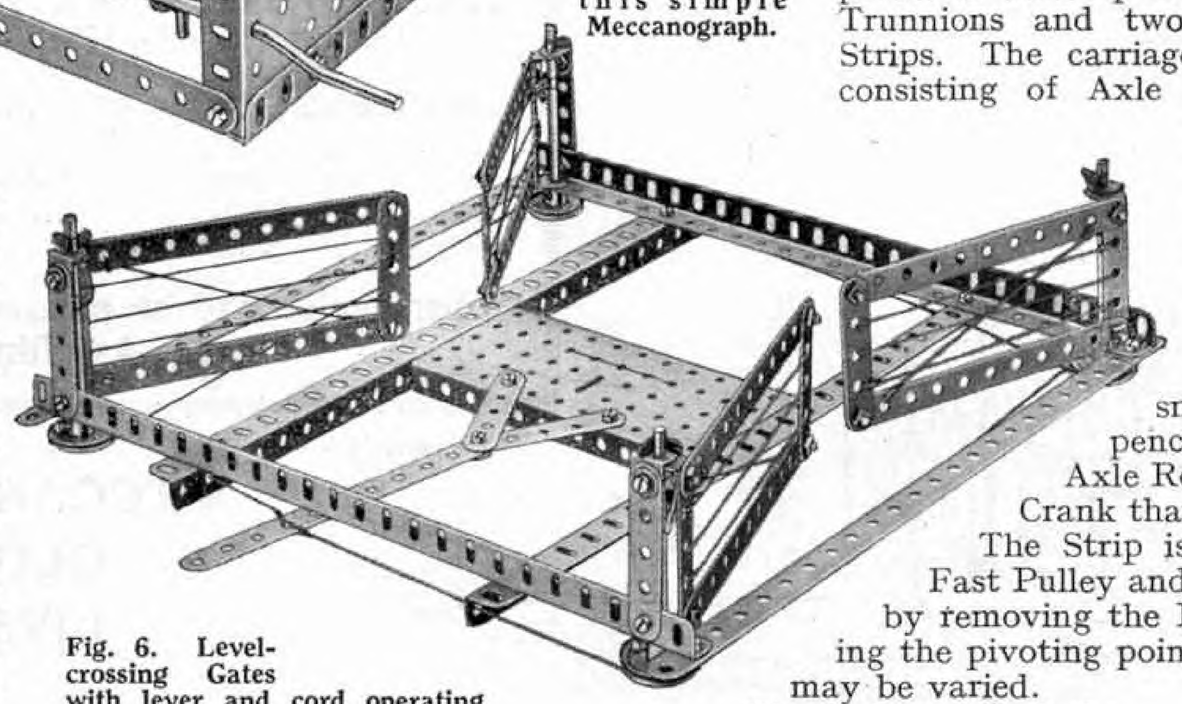
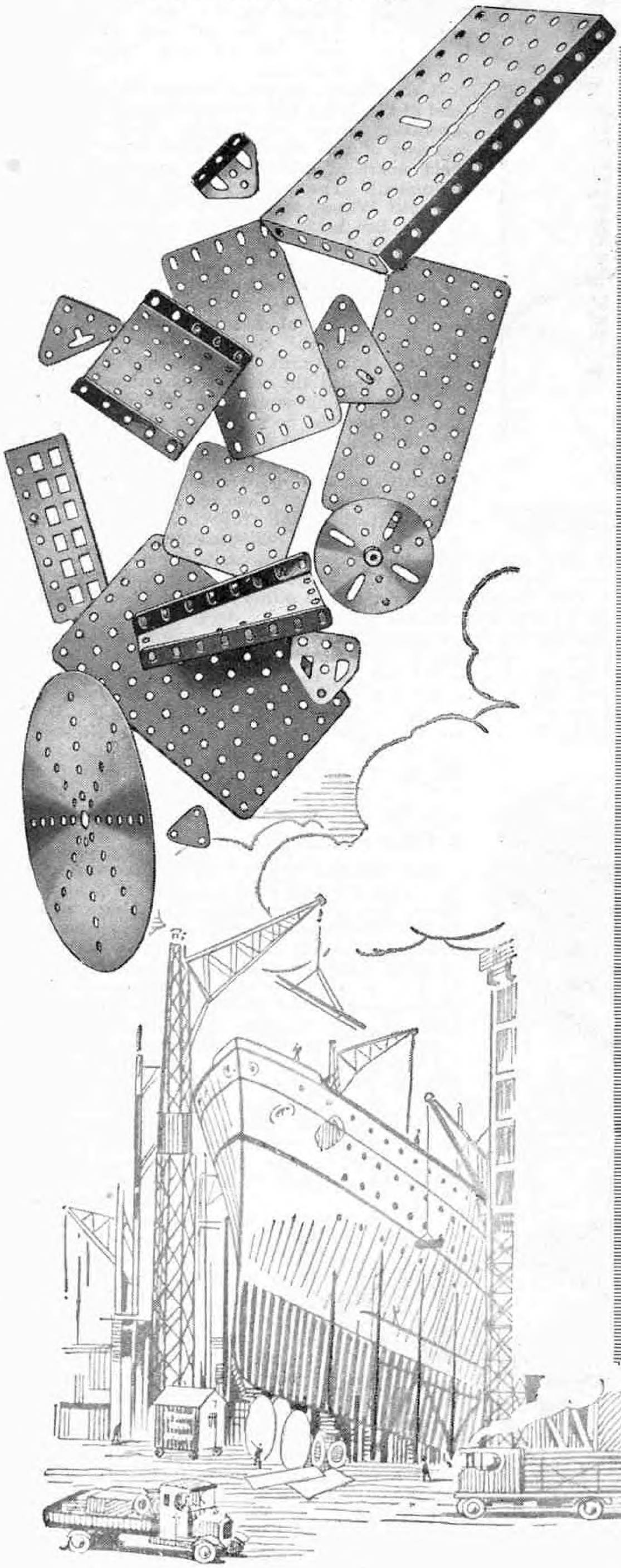


Fig. 6. Level-crossing Gates with lever and cord operating gear.

The Strip on which the

(Continued on page 462)

MECCANO
PARTS & ACCESSORIES



2. Plates

THE manufacture of steel plates in actual practice has reached a very high degree of perfection. This is due chiefly to the amazing developments brought about by the different nations in their endeavour to produce plates of sufficient toughness to withstand the ever-increasing power of enemy armour-piercing projectiles and high explosive shells. Fortunately, however, the new inventions and improved methods of preparing and rolling the metal thus brought to light are also being adapted to civil life.

Our modern banks and safe-deposits are provided with strong-rooms that defy bombs, burglars, fire and floods ; steel-encased motor-cars have been built to travel at speeds of 250 miles and over per hour ; all-metal aeroplanes have been propelled at more than 400 miles per hour ; and boilers and steam engines are now designed to withstand pressures of thousands of pounds per square inch, although not very long ago engineers dared not go beyond pressures of three or four hundred pounds !

Meccano plates, like their prototypes in real engineering, are made of the finest steel only. They are richly enamelled in bright colours—red and green—and the holes are punched cleanly and accurately. The holes are arranged according to the Meccano equidistant system, which enables the plates to be incorporated in any kind of model and used for a thousand and one different purposes.

Prices of Meccano Plates, Trunnions, etc.

No.			s.	d.
52.	Perforated Flanged Plates, 5½″ × 2½″, ½″ Flanges...	each	0	5
52a.	Flat Plates, 5½″ × 3½″	„	0	5
53.	Perforated Flanged Plates, 3½″ × 2½″, ½″ Flanges...	„	0	3
53a.	Flat Plates, 4½″ × 2½″	„	0	3
54.	Perforated Flanged Sector Plates	„	0	3
61.	Windmill Sails	4 for	0	6
70.	Flat Plates, 5½″ × 2½″	each	0	4
72.	„ „ 2½″ × 2½″	„	0	2
73.	„ „ 3″ × 1½″	2 for	0	3
76.	Triangular Plates, 2½″	each	0	2
77.	„ „ 1″	„	0	1
109.	Face Plates, 2½″ diam.	„	0	4
126.	Trunnions, 1″ deep, ½″ flange	„	0	2
126a.	Flat Trunnions, 1½″ × 1½″	„	0	1
133.	Corner Brackets, 1½″	„	0	1
133a.	„ „ 1″	„	0	1
146.	Circular Plates, 6″ diam.	„	1	0
146a.	„ „ 4″ „	„	0	6
162.	Boiler, complete with Ends...	„	1	0
162a.	„ Ends	„	0	3
162b.	„ without Ends	„	0	6

Your dealer will be pleased to show you all the Meccano Parts. Ask him for a complete list.

MECCANO LIMITED
OLD SWAN
LIVERPOOL

How Many Errors in this Engine?

Special Summer Competition

During the sunny months of summer few Meccano boys can spare much time for thinking out how to build a particular kind of Meccano model, or how to use their Outfits to the best advantage. Most of them are busy with outdoor sports and pastimes, and in view of this we are organising this month a special type of Competition that does not require a Meccano Set in order to compete. Meccano boys can prepare their entries for this month's competition while enjoying a quiet hour on the beach or resting on the grassy banks of a country lane! All they require is a copy of this month's "*M.M.*"

June "Errors" Competition

The following Prizes will be awarded in each Section, Home and Overseas.

First Prize : Meccano or Hornby Train goods value £2-2-0.
Second Prize : Meccano or Hornby Train goods value £1-1-0.
Third Prize : Meccano or Hornby Train goods value 10/6.
Five Prizes : Meccano or Hornby Train goods value 5/-.
Ten Meccano "Engineer's Pocket Books."

On this page appears an illustration of a Meccano model vertical marine engine. A few minutes' study will show that dozens of ridiculous mistakes have been made in building the model, and all a competitor has to do is to write down carefully on a sheet of paper as many of the mistakes as he can find in the model. Then it is only necessary to state briefly how each error should be corrected. *There are no entrance fees or forms.*

It should be clearly understood that to enter this contest one need not be an expert essayist; any boy who "spots" a large number of the mistakes and sets down his criticisms in a clear manner stands a very good chance of obtaining one of the principal awards.

This pleasant summer competition provides model-builders with an excellent opportunity to win valuable prizes of Meccano goods that will greatly increase the scope of their Outfits, so that when the long winter evenings come again they will be able to build bigger and more interesting models than ever before.

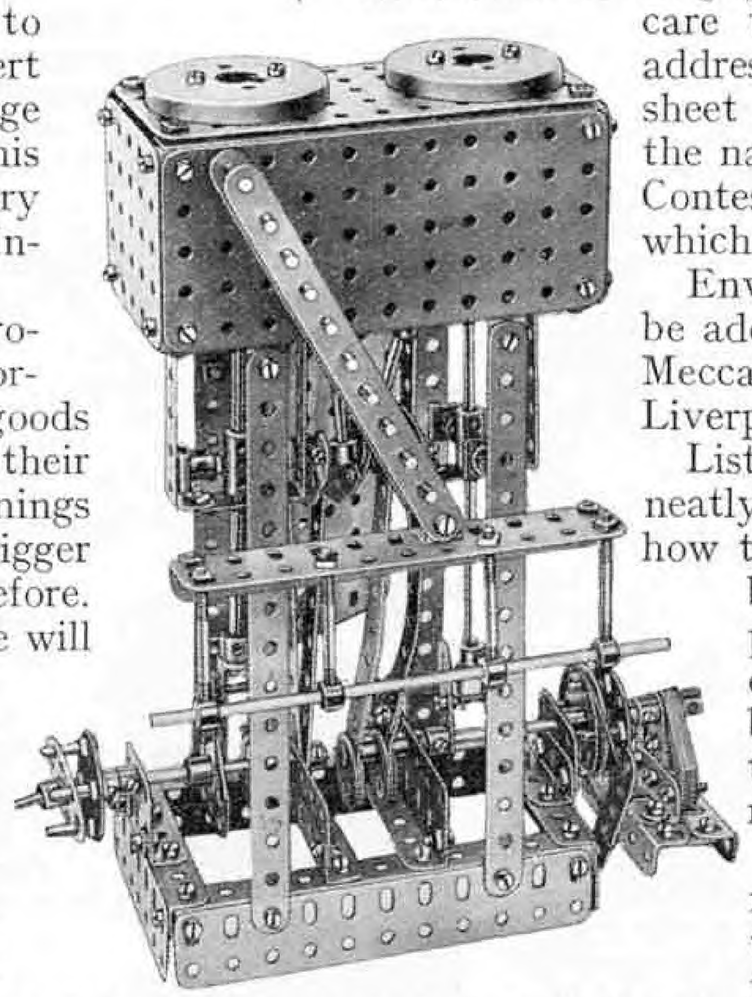
A glance at the illustration of the engine will show that mistakes have been made both in designing and constructing the model. Many of the mistakes are obvious, and any Meccano boy who has a slight knowledge of model-building and understands the elementary principles of steam engines should be able to point them out without difficulty.

Competitors should write their lists of errors in column form and then, against each item on the list, state briefly the best way in which they think the fault may be corrected. There is no doubt that many boys will be able to discover all the mistakes quite easily by building up the actual model for themselves, but it is not at all necessary to do this, for every error is plainly shown in the accompanying illustration. If no competitor succeeds in pointing out every mistake in the model the First Prize will, of course, be awarded to the competitor whose list contains the largest number of errors. If two or more competitors succeed in pointing out all the errors, the judges will give preference to those entries that are the most neatly prepared, and which contain the clearest descriptions of how the errors should be corrected.

It should be noted that there are two types of errors in the model. The first type relates to the manner in which the various Meccano parts have been used, which it will be noted in many instances is not in accordance with good Meccano practice! It is assumed, of course. that the builder had the correct Meccano parts available when he constructed the engine. The second type of error concerns the technical details of the model.

Entries will be divided into two separate sections as follows:—Section A for competitors of all ages residing in the British Isles; Section B for competitors of all ages residing Overseas. The prizes to be awarded in each Section are stated in the panel on this page.

In sending in their entries competitors should write on one side of the paper only, and should take particular care to see that their name, age and address appear on the back of each sheet of paper submitted, together with the name of the contest (June "Errors" Contest) and the Section (A or B) for which the entry is eligible.



This Meccano Marine Engine is literally "bristling" with constructional mistakes. Prizes are offered to the boys who can discover the greatest number!

Envelopes containing entries should be addressed to June "Errors" Contest, Meccano Ltd., Binns Road, Old Swan, Liverpool.

Lists of errors should be prepared as neatly as possible, and descriptions of how the model ought to be built should be kept brief and precise. Competitors who consider that their descriptions will be made clearer by means of diagrams may send these along together with the written matter.

Competitors entering Section A must post their entries so that they reach Liverpool not later than 30th July, 1932. Overseas competitors entering in Section B must forward their entries to reach Liverpool by 30th September, 1932.

Successful competitors will be advised by post as soon as possible after the closing dates, and a full account of the Contest will be published later in the "*M.M.*" This Contest calls into play the model-builder's knowledge of the correct design of a Meccano model, and at the same time there is heaps of fun to be obtained from "spotting" the errors!

Model-Building Contests Results

By Frank Hornby

"August" Competition: Section B

THE full list of prize-winners in Section A of the "August" Contest was published in the May "*M.M.*," and this month I have pleasure in announcing the results in Section B.

The entries in this Section were more numerous than in Section A, but the quality of the models is not quite so high, although the prize-winning models are quite worthy of the success they have achieved. Many competitors lost their chance of success simply because they went to little or no trouble to prepare neat drawings or clear photographs. These are most important points in Meccano model-building Contests, for no matter how well built a model may be the judges cannot estimate its merits correctly unless it is clearly shown in the drawing or photograph.

Section B (for Home competitors under 14 years of age).

FIRST PRIZE, Meccano or Hornby Train goods value £2-2s.: Raymond Atter, Tyseley, Birmingham. SECOND PRIZE, Meccano or Hornby Train goods value £1-1s.: L. J. Coe, Ipswich. THIRD PRIZE, Meccano or Hornby Train goods value 10/6: Colin Millard, Lanesfield, Wolverhampton.

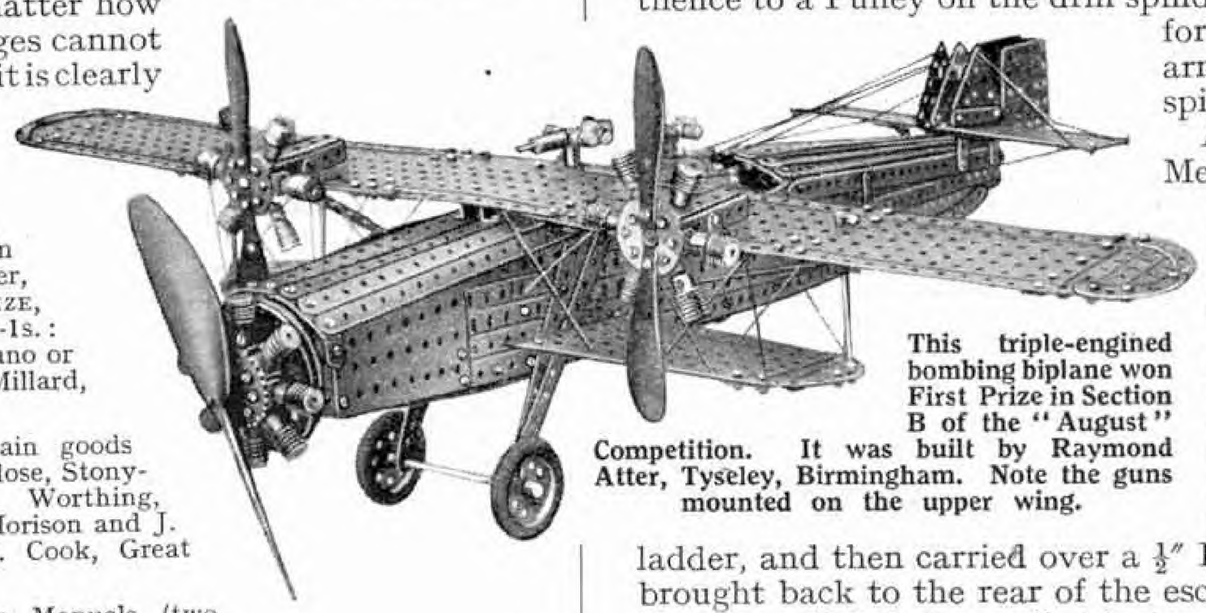
SIX PRIZES of Meccano or Hornby Train goods value 5/–: B. Reynish, Norwich; D. Close, Stonyhurst, Blackburn; T. Overington, Worthing, Sussex; D. Penzig, London, N.3; R. Morison and J. Morison (joint entry), Cambridge; R. Cook, Great Yarmouth.

TWELVE PRIZES of Meccano Instruction Manuals (two volumes): J. Horrox, York; D. Franklyn, Shirley, Birmingham; W. Stephens, Cardiff; W. Nichols, Colchester; E. Amery, N. Wembley, Middx.; J. Bland, Frant, Tunbridge Wells; A. Robinson, Manchester; J. Fitzgibbons, London, N.1; D. Manton, Hall Green, Birmingham; P. Matthews, Oxford; S. Smith, Enfield, Middx.; J. MacDougall, Greenock, Scotland.

TWELVE PRIZES of Meccano "Engineer's Pocket Books": K. Flower, Groudle Glen, I.O.M.; R. Elliott, Bishops Stortford; A. Ringrose, Limerick, Ireland; J. Breakwell, London, N.6; J. Dinwoodie, Edinburgh; E. and N. Johnson (joint entry), Rock Ferry, Birkenhead; D. Johnson, Harrow, Middx.; E. Chamberlain, Solihull, Warwicks.; V. Knill, Thorpe Bay, Essex; G. Smythe, Drumoak, Aberdeenshire; A. Thomson, Faversham, Kent; F. G. Stone, London, N.12.

CERTIFICATE OF MERIT: P. Burgess, Winchmore Hill, London, N.21; R. Davies, Harrow; O. Thomas, Solihull, Warwicks.; V. Keston, London, N.16; F. Shipley, London, S.E.25; R. Hansen, Chelmsford, Essex; B. Way, London, S.W.19; A. Eves, Chatham, Kent; D. Robinson, London, N.8; F. Greenwood, Southport, Lancs.; F. Lloyd, Middlesbrough, Yorks.; R. Dickenson, Wallasey; K. Jones, Shirley, Croydon; A. Andrews, London, N.1; H. Mason, Leicester; R. Eglen, Yeovil, Som.; E. Levaillant, Guildford, Surrey; J. Willis, Edgware, Middx.; W. Hudson, Gillingham, Kent; J. Laidlaw, St. Boswells, Roxburghshire; A. French, Stonehouse, Glos.; D. Bassil, Kingston, Surrey; H. Liversidge, Castleford, Yorks.; J. T. Davies, Abergavenny, Mon.; R. Featherstone, Derby; G. Keys, Stone, Staffs.

A boy of 13 years won First Prize in Section B. He is Raymond Atter of Tyseley, Birmingham; and his model, a three-engined biplane, is illustrated here. It is a splendid piece of work and does great credit to so young a boy. The aeroplane is of the bombing type, and it will be seen that guns are mounted on the upper plane. The rudder and aileron control wires give a very realistic appearance to an altogether praiseworthy model.



This triple-engined bombing biplane won First Prize in Section B of the "August" Competition. It was built by Raymond Atter, Tyseley, Birmingham. Note the guns mounted on the upper wing.

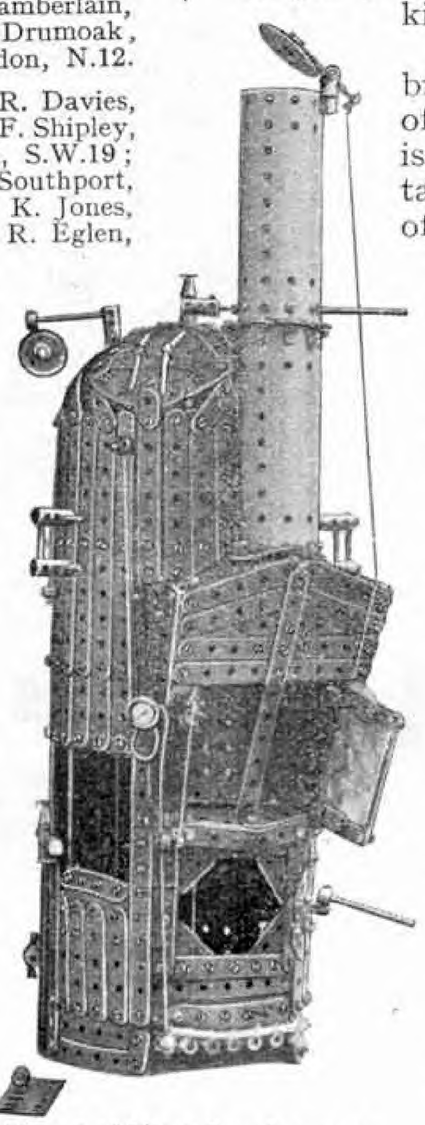
A coastal cargo steamer provided L. J. Coe, of Ipswich, with an interesting subject for the model with which he won Second Prize. Unfortunately it was not possible to include an illustration of this model owing to lack of a suitable photograph. The hull of the model is well built, and on the deck are two cranes each of which can be worked by a windlass so that they may be used to handle light cargo. A model steam winch is fitted for the purpose of "weighing anchor." A set of realistic lifebelts is included in the deck fittings, the lifebelts being made from ⅝" Rubber Rings wound with cord.

Machine tools do not often appear in Meccano competitions, although they are admirable subjects for reproduction. Section B of the "August" Competition, however, produced a good model of this kind. It is a radial drilling machine, and won the Third Prize for Colin J. Millard of Lanesfield, Wolverhampton. The drill is worked by a Meccano Clockwork Motor mounted on the bed of the model, and after reduction the Motor drive is transmitted to the pillar shaft by Bevel Gears. The radial arm or "swing" rotates on two Pulley Wheels placed face to face, with Angle Brackets secured round their peripheries in order to prevent them from working apart. The radial arm is constructed from Angle Girders, and the traversing head or carriage that carries the drill travels along the edges of the Angle Girders. The head is moved backward and forward by means of a handwheel. The drive to the drill from the pillar shaft is by means of Meccano Cord, which passes round a Pulley on the outer end of the radial arm, over a jockey Pulley, and thence to a Pulley on the drill spindle. Mechanism is incorporated for raising and lowering the radial arm, and also for feeding the drill spindle to the work to be drilled.

A neat fire engine driven by a Meccano Clockwork Motor won a prize for T. Overington of Worthing. The escape ladder is arranged so that by turning a Crank Handle the movable portion of the ladder slides upward between the flanges of Angle Girders forming the sides of the lower or fixed ladder. A piece of Cord attached to the lower end of the movable ladder, and then carried over a ½" Pulley at the top of it, is finally brought back to the rear of the escape and attached to the Crank Handle, which is journalled in two Trunnions bolted to the lower end of the fixed ladder. The other details of the model follow conventional lines.

R. B. and J. B. Morison combined their Outfits and built a good model of a low wing monoplane of a type popular in pre-War days. The model is quite a big one, the wing span being 3 ft. 10 in. and the length of the fuselage 2 ft. 3 in. The wings are supported by a king-post fixed on the fuselage just in front of the cockpit.

A simple but realistic motor tractor fitted to a three breast caterpillar plough was submitted by R. S. Cook of Great Yarmouth. The motive power of the tractor is provided by a Meccano E2 Electric Motor, which takes the place of the usual paraffin engine. The breasts of the plough are realistically represented by Propeller Blades, and they can be raised and lowered by operating a lever fixed close to the driver's seat. A handwheel is also provided for lifting the shears from the ground when the machine is not ploughing. The mechanism of the tractor includes a two-speed and reverse gear-box, brake, and belt drive to a radiator cooling fan. It is interesting to note that the tractor, which is equipped with caterpillars made from Sprocket Chain, will easily climb obstacles placed in its path.

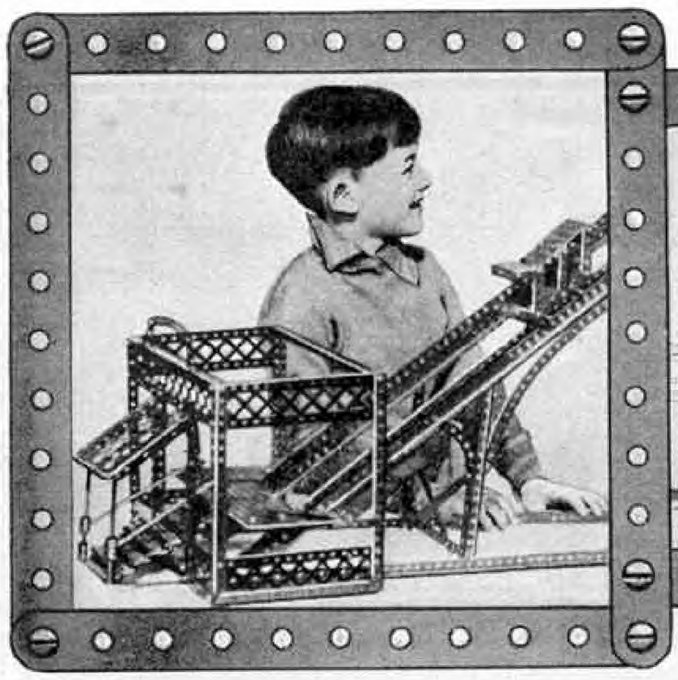


Duncan Young of West Croydon won a prize in Section A with this fine model of a Cochran Boiler. It is fitted with water tubes, fire box, steam chamber and hinged combustion chamber doors.

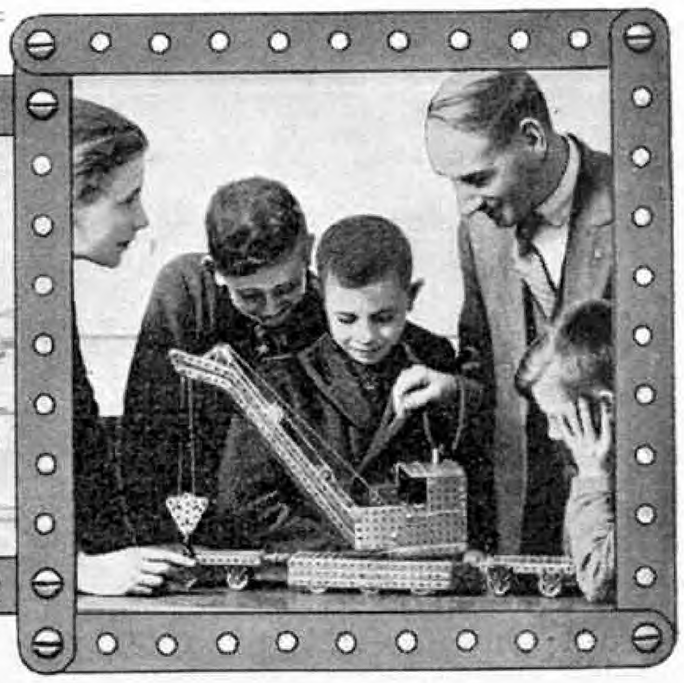
A model of the Atlantic Transport Line Co.'s, S.S. "*Minnewaska*" won a prize for D. Penzig, London, N.3, and a wind pump by D. M. Close of Stonyhurst, Blackburn, also received an award.

One of the most original entries in Section B was that sent in by Bruce Reynish of Norwich. It consists of a reproduction of an ingenious device that is extensively used in America for the preliminary training of air pilots. It consists simply of a "joy-stick" mounted on a baseboard exactly as in an aeroplane, with a small model aeroplane so arranged that by moving the "joy-stick" the would-be pilot can see exactly how each movement of the control affects the flying of the aeroplane. The "joy-stick" is connected by cords to the model in such a manner that appropriate movement of the "stick" causes the model to climb, bank, or perform any of the evolutions of an actual machine!

Many other really good entries were received but of course it was not possible to give each competitor a prize. To those who failed to win a prize I can only say, try again! And may they have better luck next time!



WITH THE MODELBUILDERS



ENGINE CROSSHEAD CONSTRUCTION

In practically every type of reciprocating engine a crosshead is utilised. The crosshead is the unit that couples the piston rod with the connecting rod; it moves backward and forward in guides or slide bars that are secured rigidly to the frame of the engine. In this way the reciprocating motion of the piston is transmitted to the crankshaft via the connecting rod.

In Meccano models of reciprocating engines the crossheads fulfil exactly the same function as the large units used in actual practice. The construction of model crossheads allows for considerable variation in design, and numerous interesting forms have been evolved for special models.

A simple crosshead that will be found to operate very satisfactorily when a "rod" type of connecting rod is used is assembled as follows. A Large Fork Piece is secured to the end of the piston rod and a Coupling is pivoted in the fork of the Fork Piece by means of a short Axle Rod. This Rod carries an Eye Piece at each end, and each Eye Piece slides on a Strip that is mounted in a horizontal position above the bed-frame of the engine. These Strips form the crosshead slide bars. The Rod forming the connecting rod is secured in the end bore of the Coupling that is pivoted to the Fork Piece.

An important point to remember when using a crosshead of this type is that the Strips forming the slide bars and the Eye Pieces must be kept well lubricated so as to reduce friction to the lowest possible amount. The slide bars should be very carefully tested for alignment in the first instance, so that there is no tendency for the sliding unit to jam.

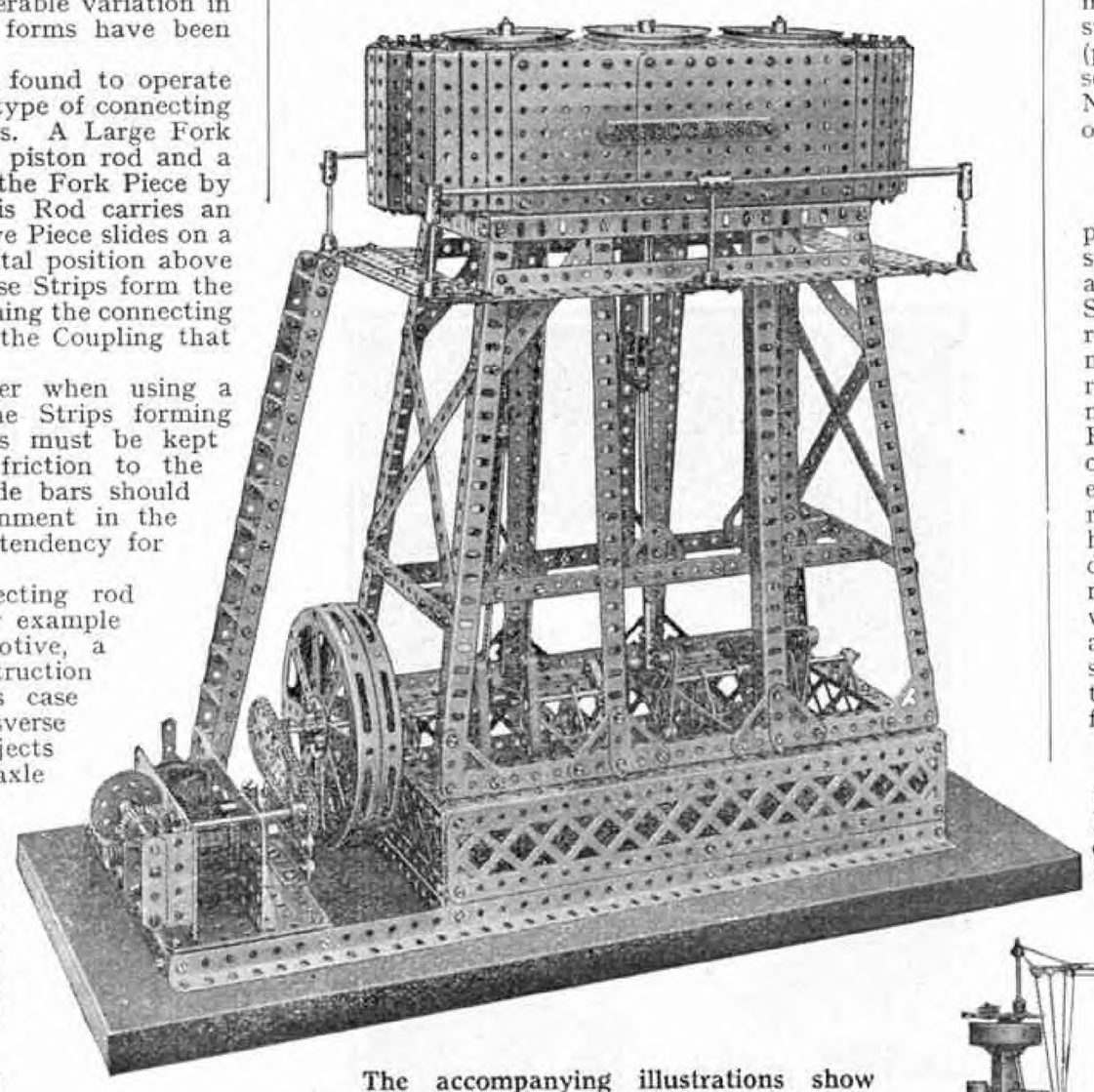
In a model where the connecting rod is of the "strip" type, as for example in a model of a railway locomotive, a slightly different form of construction is used. The piston rod in this case is passed through the centre transverse hole of a Coupling so that it projects about half an inch, and a short axle is secured in each end of the longitudinal bore of the Coupling. An Eye Piece is placed on each short Rod, and these Eye Pieces slide on guide bars fixed to the frame of the model. A Strip Coupling is now secured on the projecting end of the piston rod and the Strip forming the connecting rod is pivoted to the Strip Coupling by means of a $\frac{3}{8}$" Bolt.

A novel and realistic pattern of crosshead was recently designed for a special model of a triple-expansion marine engine, and details of this will doubtless be of interest to constructors. The crosshead is formed from four $1\frac{1}{2}$" Angle Girders and eight 1" Corner Brackets (part No. 133a). The Corner Brackets are arranged in sets of four to form the back and front of the unit, while the Angle Girders form the sides. Two $1\frac{1}{2}$" Strips are secured against each pair of Angle Girders and two Collars are in turn fixed to each pair of Strips by means of Bolts passed into the threaded bores of the four Collars. A Coupling is secured in the centre of the crosshead and this holds the end of the piston rod. A small Fork Piece is also pivoted to the lower end of the Coupling and the connecting rod is fixed in the boss of the Fork Piece.

The crosshead slides in guides formed from two pairs of Angle Girders secured to the frame of the engine. Each pair of Girders should be carefully spaced apart so that there is just sufficient room for the Collars to slide easily between them. This type of crosshead has a particularly realistic appearance, and if carefully adjusted and lubricated will be found to give extremely satisfactory results, even though the engine is called upon to run continuously over long periods. A somewhat simpler form of this crosshead may be produced by dispensing with the $1\frac{1}{2}$" Angle Girders and $1\frac{1}{2}$" Strips and using Double Brackets in their stead. A Collar is secured to each Double Bracket by means of its threaded bore, and these Collars slide in guides formed from Angle Girders in a similar manner to the unit described previously.

AEROPLANE TAIL UNIT

Recently we have received queries from owners of No. 2 Aero Constructor Outfits regarding the construction of "biplane" tail units. Two tail-planes are fitted to certain heavy aeroplanes and flying boats in order to obtain greater stability. The most famous British aeroplane making use of a tail unit of this type is the Armstrong-Whitworth "Argosy" air liner, and several readers wish to fit a tail unit of this type to the Triple-engined Air Liner (Model No. 7 in the No. 2 Aeroplane Instruction Manual) so that this model will more closely resemble its prototype. It is not possible to assemble a special biplane tail unit for this model within the limits of a No. 2 Outfit, but by obtaining a few separate Aero Parts a very realistic unit can be assembled.



A tail unit for the "Argosy" liner may be built up from seven Extension Planes (part No. P8) and 13 Angle Brackets. Two Extension Planes are used to form both the top and the bottom planes, and the multiple-rudder section is represented by three further Extension Planes held in place by means of Angle Brackets. These Extension Planes should be secured in position so that they project slightly at the rear, thus following actual practice. The complete tail unit is attached to the rear of the fuselage by means of two Angle Brackets. A $\frac{3}{8}$" Bolt is used to hold the outer Bracket in place and two Washers are slipped on to its shank for spacing purposes.

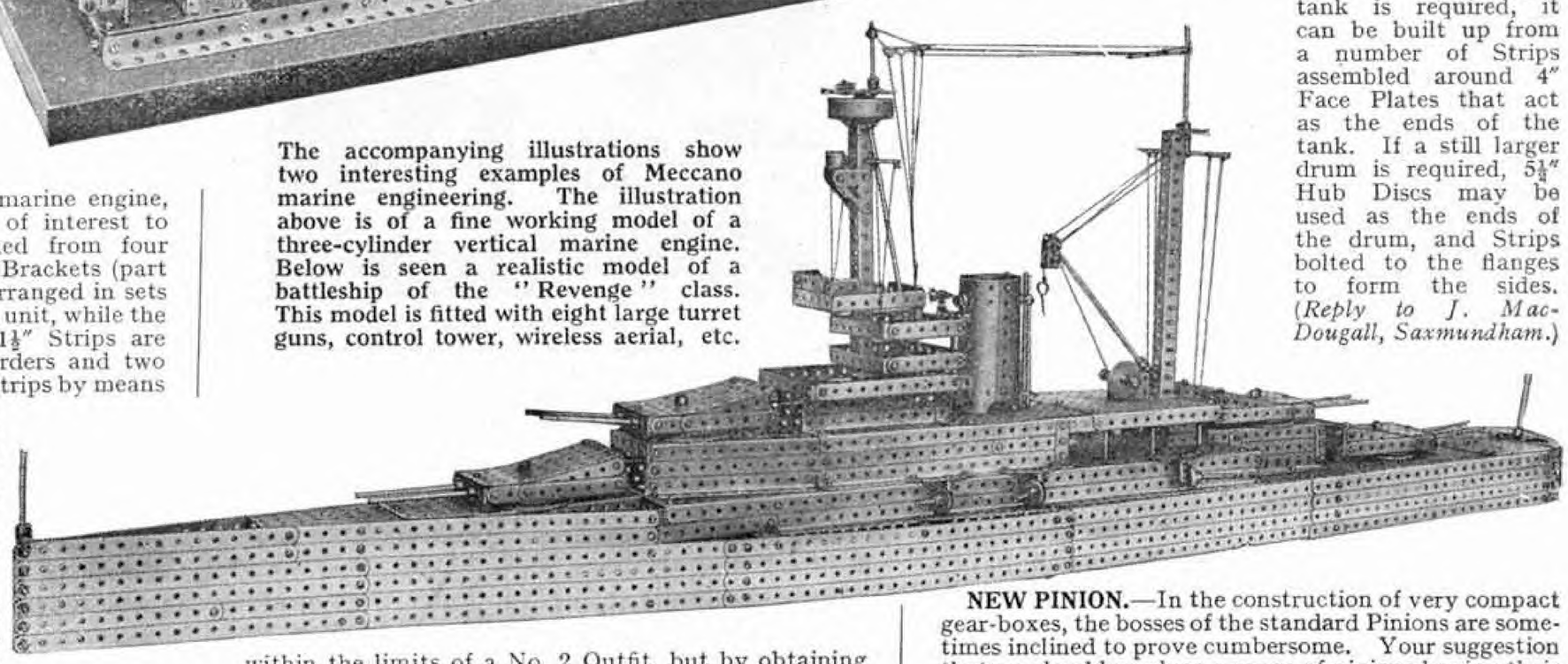
While dealing with the use of the Extension Plane in the construction of tail units, we would remind readers that many of the Aeroplane Parts may be adapted for other uses in addition to those shown in the Aeroplane Instruction Manual. For example, if it is required to reproduce a prototype in which the engines are mounted in casings supported above the wing on struts (as for example the British Saro "Cutty Sark" and some Continental machines). This assembly may be reproduced with the standard Aero Parts by mounting the Engine Casing units upside down and supporting these on Straight Centre Section Struts (part No. P29). The Centre Section Struts may be secured to the wing by means of Angle Brackets. Numerous other instances of the multiple application of the parts will be found by constructors.

A NOVEL DRIVING WHEEL

The elastic torsion motor has for some time been very popular for driving model flying aeroplanes, miniature speed boats, etc., but this type of motor has not been applied to any great extent in Meccano model-building. Several readers have written to us suggesting that rubber torsion motors should be used in the simpler mobile models. One constructor, for instance, fitted a rubber motor into a small Meccano Chassis and connected it to the rear road axle by means of $\frac{1}{2}$" and $1\frac{1}{2}$" Bevel Gears. The Motor itself consisted of a number of strands of catapult elastic suitably anchored at each end. With this he obtained some remarkable results. The drawback with a driving unit of this type, however, is that the power output varies considerably during the run, the speed and power falling off to a marked extent when the elastic becomes partly unwound. In spite of this, the system possesses several advantages, and we see no reason why model-builders should not experiment with this type of power unit in their models. We shall be pleased to receive details from constructors who carry out work on these lines.

PETROL TANK.—Your suggestion that we should introduce a special tank for use in models of petrol lorries, railway tank cars, etc., is interesting, but we do not consider that this part is necessary, as a Meccano Boiler complete with Ends serves this purpose admirably. If a larger tank is required, it can be built up from a number of Strips assembled around 4" Face Plates that act as the ends of the tank. If a still larger drum is required, $5\frac{1}{4}$" Hub Discs may be used as the ends of the drum, and Strips bolted to the flanges to form the sides. (*Reply to J. MacDougall, Saxmundham.*)

The accompanying illustrations show two interesting examples of Meccano marine engineering. The illustration above is of a fine working model of a three-cylinder vertical marine engine. Below is seen a realistic model of a battleship of the "Revenge" class. This model is fitted with eight large turret guns, control tower, wireless aerial, etc.



NEW PINION.—In the construction of very compact gear-boxes, the bosses of the standard Pinions are sometimes inclined to prove cumbersome. Your suggestion that we should produce a range of pinions having their grub screw holes bored through the toothed portion, thus dispensing with the boss, is interesting and presents possibilities. We are afraid that the idea is not practicable in the case of the $\frac{1}{2}$" Pinion owing to the relatively small amount of metal between the tooth and the axle bore, but it might be applied successfully to the larger Pinions and Gears. We shall consider your idea. (*Reply to E. Deakin, Leicester.*)

THREADED CRANK.—We were interested in your suggestion that a Double Arm Threaded Crank should be introduced. Your idea will be considered. (*Reply to B. K. Choksi, Karachi, India.*)



Enjoying the Summer Programme

The coming of June brings with it the longest evenings of the year, and I hope that the members of every Meccano Club will take full advantage of the opportunities given them of playing cricket, or of enjoying rambles, cycle runs or other healthy outdoor activities. This should be one of the happiest times of the year, and even if rainy weather should compel the abandonment of a carefully prepared outdoor programme, there is always plenty of fun to be had in the club room, where impromptu table tennis tournaments may be held or some other games organised at short notice, while odd moments may be filled in by the overhaul of club material.

Forming a Cycling Section

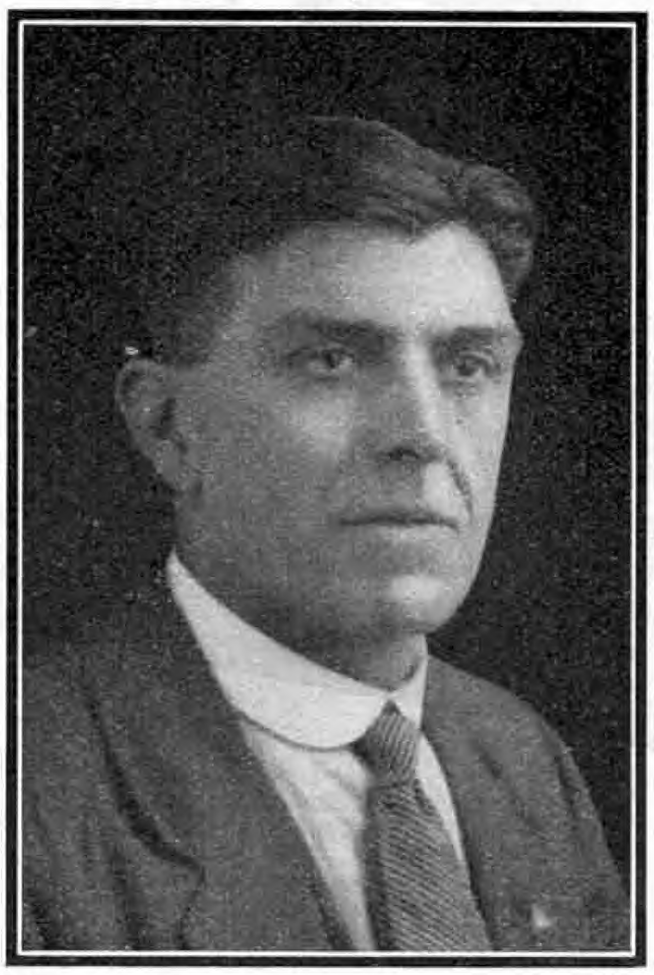
While reading the many letters I have received from Leaders and secretaries outlining the summer programmes of their clubs, I have come to the conclusion that in many instances insufficient attention is given to the possibilities of cycling, one of the finest and healthiest of all outdoor recreations for boys. The attractiveness of a club cycling run is to be found in the spirit of comradeship that prevails among the members, for to a band of happy Meccano boys, even punctures and other small mishaps incidental to these events lose their capacity for annoyance. Willing hands make light work of any repairs that may be necessary, and little troubles are forgotten in the general enjoyment.

Any club whose members include five or six keen cyclists certainly should form a cycling section, and those who are interested are sure to find their club Leader sympathetic when they explain their wishes to him. If there is sufficient support for the formation of a definite cycling group, he will appoint a senior member to take charge of it, and another may then be chosen to act as secretary. A suitable programme can easily be arranged with the help of a small committee, and if found necessary or desirable, a small weekly subscription may be called for in order to cover the cost of maps, guide books and any other articles that are likely to be useful to the members as a whole. Any surplus remaining should be placed to the credit of a repair fund, and if this is not exhausted at the end of a season, it may be used to defray the expenses of tea and other refreshments on a final run planned on a more generous scale than ordinary events in the programme.

In clubs where the ages of the members of the cycling section vary considerably, there may be a little difficulty in arranging runs to suit everybody. Young cyclists should seldom exceed 20 to 30 miles in one day, but usually it is possible to arrange that older members shall diverge from the route followed by the others to rejoin it later after traversing a greater distance. A further point of importance is that the pace of a run must be accommodated to that of the slower members, for to hurry them would spoil their enjoyment and lead to over-exertion.

Meccano Club Leaders

No. 58. Mr. C. J. Dennis



Mr. C. J. Dennis has been Leader of the Attenborough Church Choir Boys M.C. since December, 1930. The club was affiliated in October, 1929, and has gained a splendid reputation, chiefly by means of a series of successful Exhibitions at which great care was taken to explain to visitors the purpose and operation of the many working models always displayed.

Photography on Excursions

Another interesting summer activity is photography. In practically every club there are members who own cameras, and they should be encouraged to learn how to make the best use of them. Where possible, a photographic section undoubtedly should be formed, and if necessary, talks and demonstrations given for the purpose of helping the beginners. Senior members of the club may help in providing these, or the support of an expert who is interested in club work may be enlisted. In any case, it is very important that the talks should be of a practical character, and should not be mere lectures on what happens when a photographic plate is exposed.

A club showing sufficient enterprise to form a photographic section would find the effort worth while, for it is only natural that enthusiasts should take their cameras with them on club excursions. Keen amateur photographers are particularly desirable additions to cycling groups, for these usually travel further afield than other sections of a club, and their members are given more opportunities for using cameras.

An excellent plan is to award small prizes for the best collections of photographs taken on summer outings, for this develops a spirit of friendly rivalry among the photographers, and encourages them to take the necessary steps to secure good results. An important consideration is that an attractive record of the various activities of the summer session would be obtained in this manner. I hope that this course will be followed in many clubs during the present summer, and wish to remind Leaders and secretaries that I am always pleased to see photographs showing their members at work or at play, and if they are suitable, to make use of them in these pages, particularly when they show what a happy group of boys members of a Meccano Club can be.

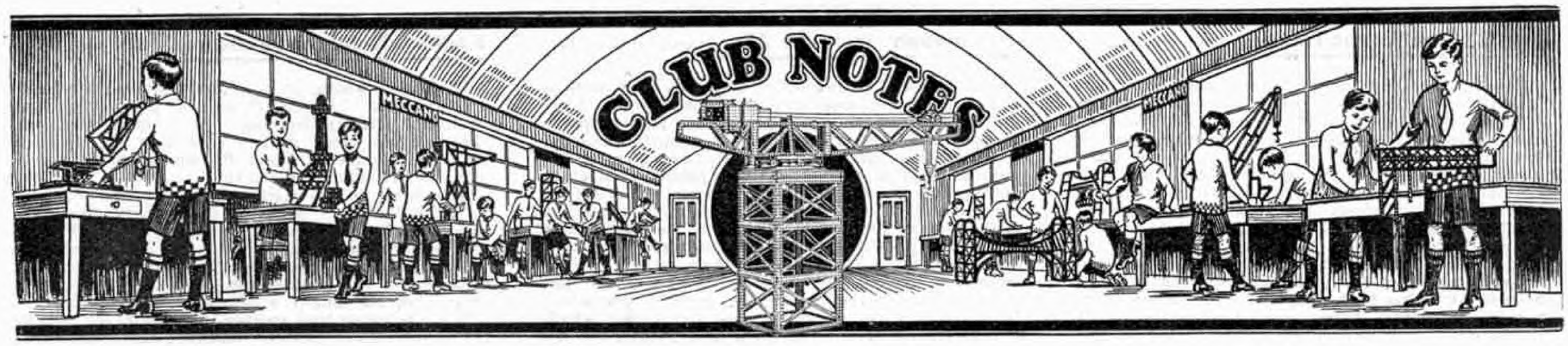
To this suggestion in regard to photographs, I should like to add a request that any that appear to be suitable should be forwarded as early as possible. This also applies to accounts of summer activities. The *"M.M."* necessarily goes to press well ahead of the date of publication and if reports of excursions are not received in good time they may have to be held over until September, or even October.

Proposed Clubs

Attempts are being made to establish Meccano Clubs in the following places, and boys interested in becoming members should communicate with the promoters whose names and addresses are given below :—

LONDON, W.5—Mr. K. M. Blake, Ealing and District Y.M.C.A., Bond Street, Ealing, London, W.5.

CHADWELL HEATH—T. Frankland, 43, Bushgrove Road, Chadwell Heath, Essex.



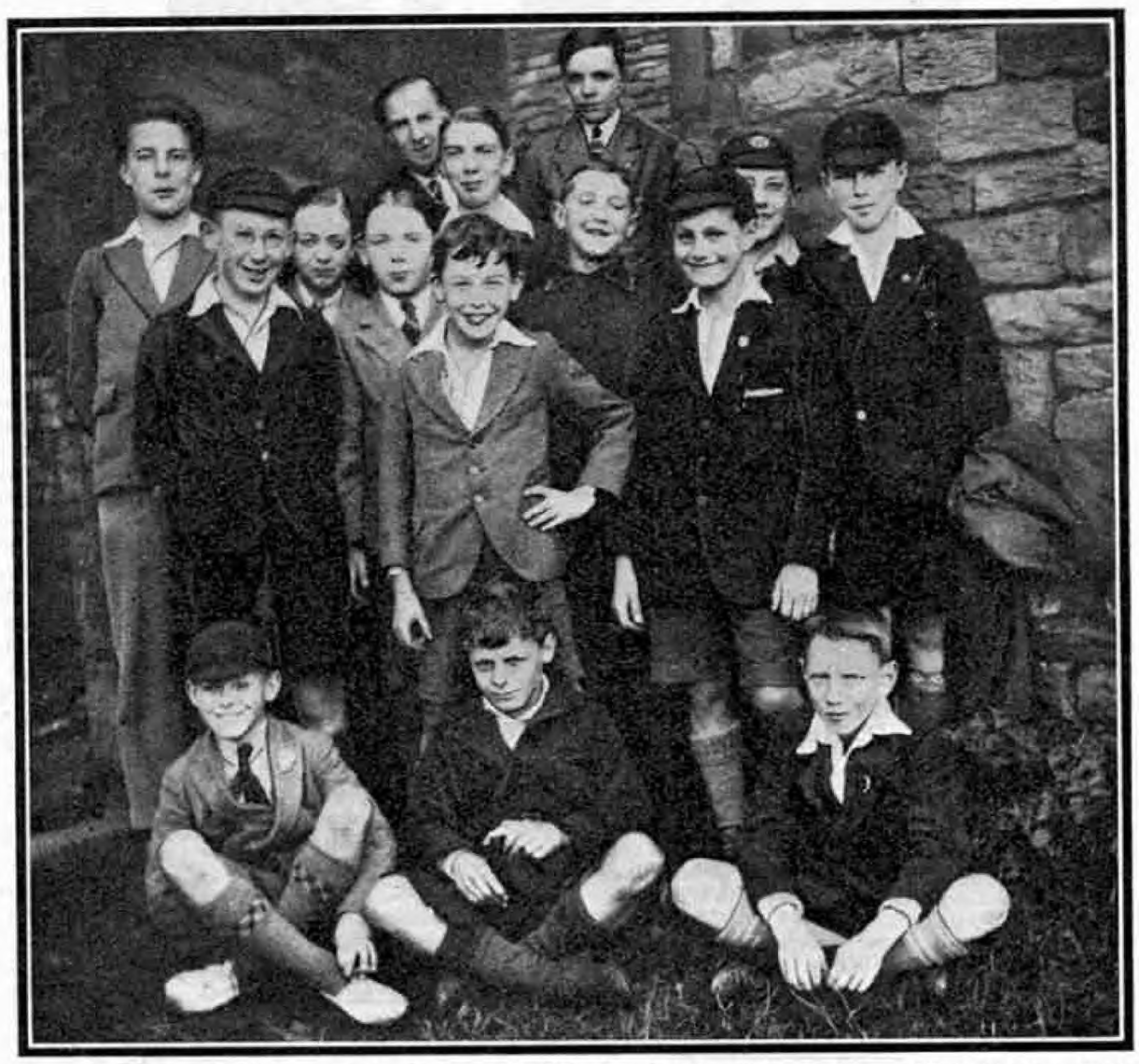
Elm Road (Beckenham) M.C.—One of the most interesting of recent meetings was an "How to Make and Do" Evening, when members were shown how to mend taps, carry out simple soldering operations and do other simple tasks. Other meetings included a debate, a lecture on "*Travels in the Western Highlands of Scotland*," illustrated by slides kindly loaned by the L.M.S.R., and a demonstration of film development and printing. The chief Model-building Evening was devoted to the construction of representations of objects used on railways, team marks being awarded. Club roll: 28. *Secretary:* C. Price, 52, Queens Road, Beckenham, Kent.

St. Peter and St. John's (Exeter) M.C.—Interest is centred chiefly in the club's Model Workshop. New machines are installed regularly, and the Hornby Train Layout is worked in connection with the model, which is provided with the necessary sidings. Members' knowledge of the principles of engineering is being greatly enlarged by work on the model, and this is to be greatly improved by further additions. Club roll: 25. *Secretary:* Mr. J. Blaker, c/o 60, Elmside, Exeter.

Attenborough Church Choir M.C.—A special display of Meccano Bridges built by members has been held. All types were represented, including girder and jack-knife bridges, and one model of special interest was a working representation of the Tower Bridge. At other meetings Games Tournaments have been arranged, the final rounds of these arousing great excitement. Club roll: 30. *Secretary:* A. E. Dodd, "Wyville," Devonshire Avenue, Long Eaton, Notts.

Bell Hill and District M.C.—The most outstanding recent event was a visit to the Ford Works at Dagenham, where members saw the making of the new Ford vans. Special interest was shown in the wonderful machinery installed, all of which is electrically driven, the electric gantry cranes receiving special attention. Club roll: 13. *Secretary:* R. A. Hart, Kingswood Hall, Vange, Essex.

Braintree High School M.C.—In a special Model-building Contest, Racing Cars had to be built, the marks awarded to the entries depending on the speed attained in trials. Great ingenuity was shown by members in building models that were light and yet strong. The winning model was a small car that was hauled along in the same manner as an electric hare, and there were fierce arguments as to the legitimacy of this method of propulsion! Work on the club model of a funicular railway continues, and at other meetings members have enjoyed games of Table Tennis and Chess. Club roll: 23. *Secretary:* P. Allen, St. Edmunds, Bocking, Braintree.



A merry group of Meccano boys photographed during a summer excursion. They are members of the Sheffield M.C. and this interesting picture was obtained during an enjoyable visit to Manor Park. The club was affiliated in December, 1927, and has pursued a splendidly varied programme under the enthusiastic leadership of Mr. R. Traylen.

Clacton-on-Sea High School M.C.—A series of Model-building Contests has been arranged and excellent entries were secured. A special attraction was a meeting devoted to Hornby Train operation on an extensive track. A Lantern Lecture has been given by Mr. J. L. Howl, Leader of the club, slides being kindly loaned by the L.N.E.R.; and an interesting visit has been paid to Clacton Post Office, where thorough explanations were given by a Post Office engineer. Club roll: 20. *Secretary:* D. E. Mills, "Isworth," Vista Road, Clacton-on-Sea.

Chertsey M.C.—A Boxing Contest, Model-building Competitions and Hornby Train Evenings have formed the greater part of the recent programme. Special attention is now being given to outdoor work, and an excellent programme of cricket and other summer pursuits has been arranged in order to make the outdoor season of 1932 a record for the club. Club roll: 27. *Secretary:* V. Brown, Arbon Grove Cottage, Lyne, Nr. Chertsey.

Old Charlton M.C.—Talks by members have been given on "*Bicycles*," "*Airships*," "*The Parts of a Motor Car*," "*X-Rays*" and "*Chemistry*." The talk on "*Chemistry*" was illustrated by experiments and was given by the secretary. Special Model-building Evenings have been devoted to the construction of Ships, Cranes and Safes. Club roll: 16. *Secretary:* B. Stevens, 53, Mount Street, Charlton, S.E.7.

Greenock Academy M.C.—In addition to Model-building Evenings, the programme has included visits to a worsted mill, and to the office of the "*Greenock Telegraph*," where the production of an edition was followed. An excursion into the neighbouring hills also proved attractive, and it is hoped that further events of this kind will be arranged during the outdoor season. Club roll: 78. *Secretary:* I. D. Leitch, 26, Dempster Street, Greenock, Renfrewshire.

Newcomen (Hull) M.C.—A series of Cinema Displays have been given by Mr. Cook on his Pathè Projector. Mr. Cook has now been elected Assistant Leader, together with Mr. Sharp, and increased enthusiasm has followed a proposal to enlarge the scope of the club's work and to increase membership. Regular meetings have been spent in Model-building and in Hornby Train operations. Club roll: 9. *Secretary:* H. Acklam, 103, Newcomen Street, Hull.

Plymouth M.C.—"*The Gear Box*," the club's magazine, has been enlarged, and the extra cost has been justified by the increase in the demand. Joint meetings are being held with the Hornby Railway Company section. Recent subjects for Model-building have included Motor Cars, Steam Engines and Guns. The Library continues to grow in a satisfactory manner. Club roll: 57. *Secretary:* G. Symons, 6, Holland Road, Peverell, Plymouth.

St. James' (West Streatham) M.C.—Special meetings have been devoted to the construction and trial of model racing cars. Excellent speed records already have been achieved, but efforts are to be made to surpass them. Special competitions for models built with a certain number and variety of parts have been held, and a large number of excellent models were built for the Exhibition. Club roll: 24. *Secretary:* C. Mizen, 64, Fallsbrook Road, Streatham, S.W.16.

Stamford Hill M.C.—The first winter season of work as an affiliated club was marked by a great increase in enthusiasm. The original number of members has been more than doubled and it is now necessary to form sections. All members worked hard in preparation for the Exhibition, large models such as the Dragline and the Meccanograph being built. Other activities have included Stamp Collecting and Games, and a Wireless Section is to be formed. Club roll: 25. *Secretary:* D. Weitzman, 63, Amhurst Park, Stamford Hill, N.16.

Croydon High School M.C.—A special Exhibition was held immediately after affiliation to the Meccano Guild had been secured, in order to arouse interest and to secure new members. More than 200 visitors were greatly attracted by the models on view, showing this by the number of questions they asked in regard to the exhibits. A Cinema Show was a valuable addition to the attractions. At ordinary meetings, Model-building with the Aeroplane Constructor Outfits has chiefly interested members, and the programme for the future includes outdoor games and visits to various places of interest. Club roll: 37. *Secretary:* R. F. R. Blackstone, 64, Montagu Gardens, Wallington, Surrey.

Gate House M.C.—An Exhibition and Fête arranged at short notice proved very successful. The models shown included an extensive Warehouse, fully equipped with cranes that unloaded trucks arriving alongside on the club's Hornby Train layout. Fretwork models also were on view, and a bogus Art Gallery, a Punch and Judy Show, and a Waxwork Show in which members took part, caused much laughter. A substantial sum was collected from the many interested visitors. Photography will form one of the chief activities of the summer months, and special rambles for photographic purposes are being arranged. Club roll: 12. *Secretary:* E. Hawkins, Gate House, Ingatestone, Essex.

Maidstone M.C.—Mr. T. E. G. Baker has resigned the Leadership, and Mr. R. Hawkins has kindly accepted the post. A special "*Meccano Magazine*" Evening has been held, members choosing the article they thought most attractive and reading extracts to the club. A visit has been paid to the local Automatic Telephone Exchange, and to a special exhibition of film dealing with the making of paper. A talk has been given on "*Model Railways*" and this was followed by a Model-building Competition, when one member exhibited a representation of the epicyclic gearbox used on former models of Lanchester cars. Club roll: 11. *Secretary:* Mr. E. E. Stedman, 225, Tonbridge Road, Maidstone.

AUSTRALIA

Melbourne M.C.—Work in preparation for the First Annual Exhibition has occupied most meetings, the models built including the Meccano Loom, Grandfather Clock, Ship Coaler, Baltic Tank Locomotive, Workshops and Aeroplanes. An extensive Hornby Train Layout complete with the Hornby Control System also was prepared. At other meetings amusing railway records were played on a gramophone, and members' stamp collections were inspected and compared, while Mr. Cock, father of a new member, described a shipwreck on The Lizard in 1907 in which he was involved. The lecturer displayed specimens of the reef on which his vessel struck! Club roll: 48. *Secretary:* L. Ison, 8, Hayes Street, Northcote, N.16, Victoria.

Sydney M.C.—Members have been greatly interested in the opening of the Sydney Harbour Bridge, and visits of inspection have been made; while the new P. & O. liner "*Strathaird*" also has been visited. A library has been formed and meetings have included lectures by members on Stamp Collecting and railway subjects, together with Model-building Contests. A special Social was held to celebrate the grant of affiliation to the Meccano Guild, the chief event of this being a Games Competition. Club roll: 24. *Secretary:* W. J. T. Watson, 595, Parramatta Road, Leichhardt, N.S.W.

DENMARK

Copenhagen M.C.—The first birthday of the club was celebrated by a Social Evening, at which members presented a short play. Interesting Lantern Lectures have been given by members, the subject of one of them being "*Can Animals Laugh?*" Demonstrations of the Aeroplane Constructor Outfits and of aeroplane models built from Meccano parts also have been held. Visitors are encouraged to attend meetings, and it is hoped that in this manner new members will be secured. Club roll: 8. *Secretary:* F. Severin, Rud Berghsgade 17, Copenhagen, Denmark.

Artists of Prehistoric Times—(*Cont. from p. 423*)

of Boskop man, as the prehistoric ancestor of the Bushman was called, have been dug from the floors of caves in various parts of South Africa, and examination of these has revealed the surprising fact that his brain was larger than that of any other type of human being yet known. Although it is not certain that the possession of a large brain is a proof of ability, it seems clear that Boskop man was greatly superior to his descendants, a race that is well on the way towards extinction.

To a certain extent, the problem of discovering who was responsible for the paintings and rock carvings of South Africa has been complicated by the discovery that in prehistoric times giant hunters inhabited certain districts in which remarkable art treasures have been discovered. Fossilised bones of a representative of this race have been unearthed at Springbok Flats, 80 miles north of Pretoria. None of the bones discovered was complete, but sufficiently large fragments were obtained to show that he was at least 5 ft. 10 in. in height, and that his head was a little larger than that of the average modern Englishman. In appearance and in general characteristics he must have been quite different from the ancestors of the Bushmen, and it has been suggested that the race to which he belonged came to South Africa from the north thousands of years ago. It seems to be certain that this race was very intelligent, and it is probable that its representatives had reached a comparatively advanced stage of civilisation.

The Flats in which the remains of this giant hunter were discovered are in the centre of what is known as the Bushveld, and for this reason, the prehistoric people whom he represents have been called Bushveld men. It cannot be said with certainty that the Bushveld men created the wonderful prehistoric art of South Africa, but further excavations may bring to light new facts that will enable us to solve many of the interesting problems connected with the early inhabitants of this portion of the continent, and perhaps also of Rhodesia and other regions further north.

Rubber Cored Golf Balls—(*Cont. from p. 425*)

the same speed, and any defects would be revealed immediately. A careful watch is kept for peculiarities of flight displayed by the balls driven from the machine in order that a continual check may be kept on the qualities of the product of the factory. Tests of resiliency also are made, these trials being carried out by means of an air gun that drives balls from a tee at a speed of 150 m.p.h. into a heavy pendulum from the movement of which the force of the impact is calculated.

Sample balls from every consignment also are tested by means of X-rays. The core of a golf ball is denser than the windings and the cover, and therefore absorbs the rays more thoroughly. For this reason it shows clearly in an X-ray photograph of a golf ball, and it is easy to detect instances in which it is not centrally placed, or in which it is not of the correct size. So many improvements have been made in the methods of manufacture that to-day it is practically impossible to produce a golf ball with a core that is not truly central, but X-ray examinations are still carried out in order to ensure that other faults do not develop.

A Camping Holiday—(*Continued from page 429*)

Camp duties should be divided equally between the different members of the party. It should be made an invariable rule that washing up is done immediately after each meal, otherwise there is a danger that it may not get done at all! If there is not a sufficient supply of hot water to remove grease, this can be got rid of by rubbing with the hard sandy earth to be found on the bed of a stream. As regards drinking water, a small, bright, swift-running stream is generally quite pure, but to be on the safe side it is a good plan to ask the farmer's opinion.

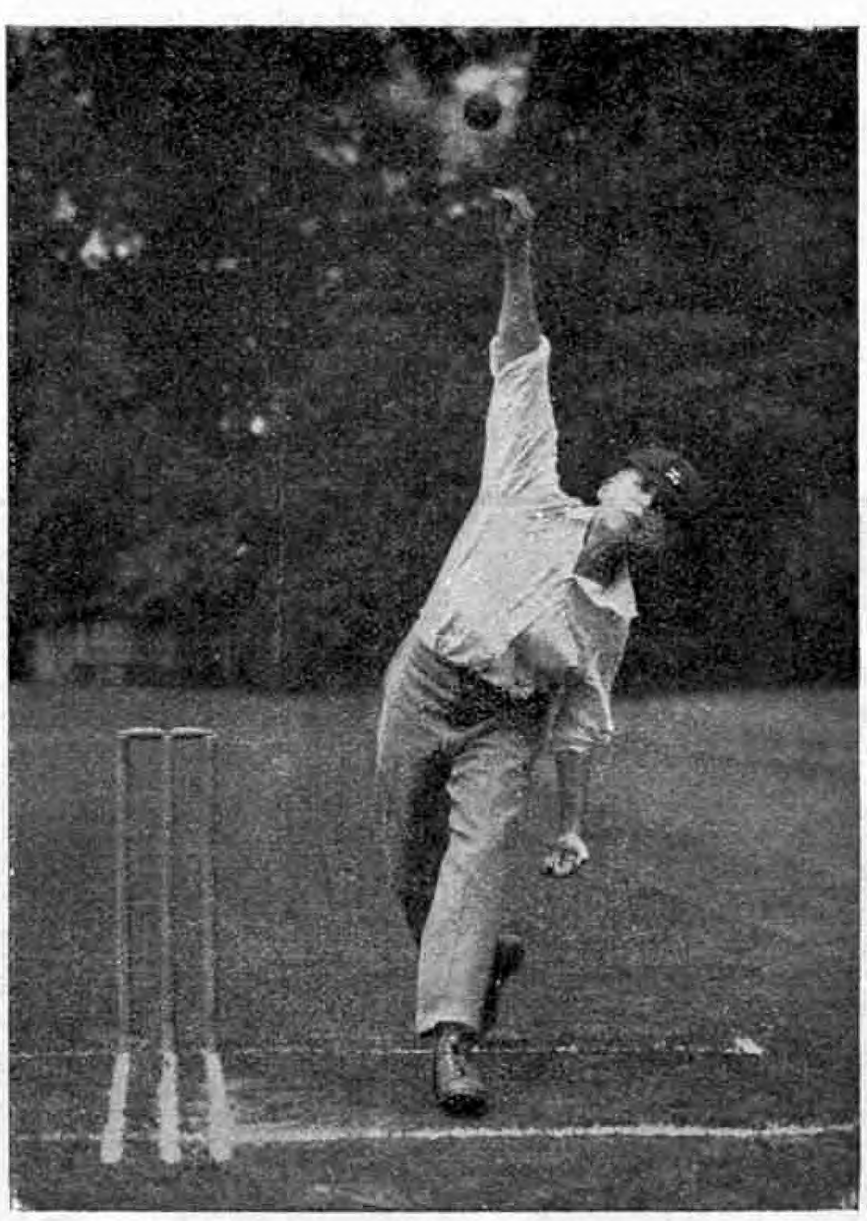
Rain can make matters very unpleasant for the camper unless a few simple precautions are taken. A tent cloth should not be touched when wet, but if rain finds its way in, trouble may be averted by tracing a line with the finger from the leak to the edge of the tent.

Before turning in for the night the guy ropes of the tent should be slackened off, as these tighten appreciably when wet with dew or rain. This precaution will avoid the possibility of the pegs being pulled up, or the tent cloth torn. Those who are camping for the first time may find it difficult for a night or two to sleep on the hard ground, but it is surprising how quickly one becomes accustomed to this. Clothes worn during the day should be folded up neatly and placed on the ground under the body. A small bundle placed under the small of the back helps to make matters more comfortable.

Wherever the camp may be pitched, it is absolutely necessary that all litter should be cleared away before leaving. Great attention should be paid to this point, and all rubbish should be buried. If untidy remains of a camp are left, the next campers who come along and ask permission to pitch their tent are likely to meet with a very cold reception. Finally the farmer should be visited, and his account, if any, should be settled.

Photography from the Air—(*Cont. from p. 433*)

process of rapid photography, by which it is possible to reduce the minimum time, from the exposure of the film in the camera until the finished photograph is dropped from the machine, to seven minutes. Usually, however, it is advisable to allow from nine to ten minutes in order to ensure perfect results. After the pictures are finished they are dropped in a special messenger tube with a pocketed streamer, somewhat in the form of a miniature parachute. In this manner completed photographs can be delivered in field operations much more rapidly than by the former method of having the negatives developed and the prints made at the Squadron's base of operation. In this work a special dual-purpose film is used, which is negative by transmitted light and positive by reflected light. During the Field Exercises of 1930 an aerial photograph was made of the city of Sacramento.



An action photograph from the "Boys' Book of Cricket" by F. A. H. Henley, published by G. Bell & Sons Ltd., price 3/6.

The negative was developed in the aeroplane and dropped within 12 minutes to a waiting newspaper representative. The photograph was reproduced in the newspaper, and this was on sale in the streets in less than an hour.

For the information contained in this article we are indebted to the courtesy of the Information Division of the United States Army Air Corps.

Air Transport—(*Continued from page 435*)

Marconi-Adcock direction-finder. The first station of this type to be erected has been built by the Marconi Company for the Air Ministry at Pulham, Norfolk. The apparatus has been subjected to many tests. During a night flight specially arranged by the Air Ministry, 14 observations were made by an aeroplane transmitting signals from known positions so that a check could be kept. In every case the distance was about 100 miles, and the results obtained by the new direction-finder were extremely accurate. The ordinary system of wireless direction-finding was at the time most unreliable, even over much shorter distances.

Details of the Marconi-Adcock apparatus may not be published at present, but it may be said that the station at Pulham is provided with four vertical aerials suspended within lattice wood towers. These are erected at the corners of a square, the diagonal of which bears a special relation to the wavelength to be employed. The bottom end of each aerial is connected to the receiver and radio-goniometer, which is situated in a hut at the centre of the square, by special insulated feeders that are completely screened and are non-receptive.

The wave range of the Marconi-Adcock station at Pulham is between 800 m. and 1,800 m., but the new system may be used over an even more extensive band of wave lengths. Experiments that have been carried out show that the station is capable also of receiving short-wave signals in a satisfactory manner.

Engine's Remarkable History—(*Con. from p. 439*)

"*Cornwall*" which, in a similarly altered condition, still remains. "*Aerolite*" is now principally used to haul "Officers' Specials" as required when inspections are being made. It is now the only remaining example in Great Britain of the Worsdell-Von Borries compound system.

The career of this engine is indeed remarkable. If we count the first "*Aerolite*" on the Leeds Northern as a direct forerunner of the present engine, it has had five separate stages of existence—a 2–2–2 well-tank with outside cylinders, a 2–2–2 well-tank with inside cylinders, a 2–2–2 side-tank, a 4–2–2 two-cylinder compound, and finally a 2–2–4 compound.

It is interesting that another locomotive, No. 1619 of the former North Eastern Railway, now withdrawn, was the only engine to which two different systems of compound working have been applied. It was built as a two-cylinder compound on the Worsdell-Von Borries plan in 1892-3. In 1898 it was completely rebuilt as a three-cylinder compound on the Smith system, and was the first locomotive to incorporate this method of two-stage expansion. The Smith system, of course, is the one that with modifications, was applied so successfully on the Midland Railway and is now largely employed on the L.M.S.R.

New Meccano Models—(*Continued from p. 455*)

table is rotated can also be altered, this being carried out as follows. The table, which may consist of a sheet of stiff cardboard or plywood, is secured to a 3" Pulley Wheel mounted on an Axle journalled in the frame. A second 3" Pulley and a 2" Pulley are mounted on the lower end of the Rod. An Axle is journalled in the centre of the Flanged Plate at the other end of the frame, and this carries 1" and 1½" Pulley Wheels. An endless length of Cord is used to couple either of these Pulleys with the Pulleys on the table shaft, the resulting slackness being taken up by means of a spring-mounted jockey pulley. A 1" Loose Pulley is mounted on a ½" Bolt secured to a cross-shaped arm composed of 3½" and 1½" Strips. The arm is pivoted to an Angle Bracket secured to the frame, and a Spring is mounted in the position shown in order to keep the Cord under tension.

The Rod carrying the 1" and 1½" Pulleys is fitted with a 57-teeth Gear Wheel that engages with a Worm mounted on the Crank Handle shaft and also meshes with ½" Pinions secured on the pencil arm and carriage oscillator shafts respectively. It will be seen that a length of elastic 2 is attached to the pencil arm and also to a 5½" Strip secured to the frame in an upright position. The elastic serves to keep the pen arm in contact with the Threaded Pin secured to the Bush Wheel on the oscillator shaft.

The Meccanograph contains the following parts:—1 of No. 1; 6 of No. 2; 1 of No. 3; 4 of No. 5; 1 of No. 6a; 4 of No. 8; 1 of No. 10; 11 of No. 12; 2 of No. 15; 2 of No. 16; 2 of No. 17; 1 of No. 18a; 1 of No. 19; 2 of No. 19b; 1 of No. 20a; 1 of No. 20b; 1 of No. 21; 2 of No. 22; 1 of No. 22a; 1 of No. 24; 2 of No. 26; 1 of No. 27a; 1 of No. 32; 10 of No. 35; 52 of No. 37; 9 of No. 37a; 11 of No. 38; 1 of No. 40; 1 of No. 43; 1 of No. 44; 2 of No. 45; 2 of No. 48; 2 of No. 52; 2 of No. 53; 3 of No. 59; 2 of No. 62; 2 of No. 111; 4 of No. 111c; 2 of No. 115; 1 of No. 125; 2 of No. 126a.

Level-Crossing Gates

The model level-crossing gates shown in Fig. 6 can be incorporated in a model railway layout with very little modification. The operating lever could be connected by rodding and cranks to a lever in the signal cabin and the gates arranged to work automatically with the line signals.

The model is very simple to build, and the main constructional points will be clear from the illustration. The operating cord, which is connected to the pivoted lever, is passed once round the groove of each 1" Pulley secured to the gate pivots, the cord being taken round the Pulleys in opposite directions.

Parts for the Level Crossing Gate are as follows:—2 of No. 1; 9 of No. 2; 10 of No. 5; 4 of No. 8; 4 of No. 10; 4 of No. 12; 4 of No. 16; 4 of No. 22; 8 of No. 35; 35 of No. 37; 4 of No. 38; 1 of No. 40; 4 of No. 48a; 1 of No. 52.

"Floodlights on Photography"

"*Floodlights on Photography*" is the title of an attractive and interesting booklet just issued by Burroughs Wellcome & Co. The striking cover in blue, black and aluminium carries illustrations of floodlighting effects photographed during the Faraday Centenary celebrations, and in the text are various photographs showing the effects to be obtained by toners and stains. The booklet deals with methods of obtaining correct exposure by means of the "Wellcome" calculator, which gives the required time by a single turn of a disc. Development of films in ordinary light by the use of "Tabloid" desensitiser and "Kytol" developer, and the improvement of dense or under-exposed negatives by safe and simple methods of reduction or intensification, are among the other subjects dealt with.

A copy of the booklet will be sent free to readers who apply, mentioning the "*M.M.*," to Burroughs Wellcome & Co., G.P.O. Box No. 213A, London.



The OUTDOOR WORLD

AND ITS HIDDEN BEAUTIES

OPENING THE BOOK OF NATURE

IN many respects June is the most delightful month of the year in this country. The days are long, and in a normal summer—which unfortunately we have not had lately—the weather is fine and warm, but without the intense heat that July and August often bring. Many of the wild flowers have come and gone, but most of the trees are in their full glory, clad in a coating of green of wonderful freshness and purity.

The craze for rambling—or "hiking," to use an ugly and unnecessary word that appears to have forced its way into general use—is a splendid thing in many respects, but there is a danger that it is becoming organised into what one might call "point-to-point" walking. To start off in the morning with the main object in view of reaching another point so many miles away before nightfall results in plenty of fresh air and exercise, but often many of the real beauties of the countryside are missed in the process. At the end of such a day the ramblers will be able to tell you a good deal about hills and mountains, rivers, lakes and waterfalls, but enquiry will show that they have completely missed the less spectacular beauties.

The only way to really enjoy these beauties and to learn something about them is not to scurry past along road or footpath, but to sit down and quietly observe them. This does not necessitate a lazy outing by any means, for plenty of exercise may be obtained in reaching some stretch of quiet country where all traces of the town are left behind. When this destination has been reached, however, the walking has served its purpose, and one settles down to wander quietly about, drinking in the beauty of the scene.

A great deal of real enjoyment is to be had in this manner without any definite object; but a still better plan is to cultivate a special interest in some particular feature. Books on nature study are now so plentiful and cheap as to be within the reach of everybody. The best possible scheme is to select some section of natural history, read it up at home, and then go out into the wilds and see for oneself the things that the book describes and illustrates. There is variety enough for everybody—birds, beasts, trees and flowers; while if none of these appeals, then there are the ever-changing clouds above with their special weather meanings, and the rocks below in which may be read something of the story of the Earth. Whichever branch of study is taken up will provide the keen interest of recognising out in the open features about which one has read in books. One may have looked at these things with unseeing eyes a thousand times before, but to look at them for the first time with intelligent knowledge of their meaning gives one something of the thrill of the discoverer.



"For goodness sake let go; you've emptied the bottle!"



Quiet confidences!

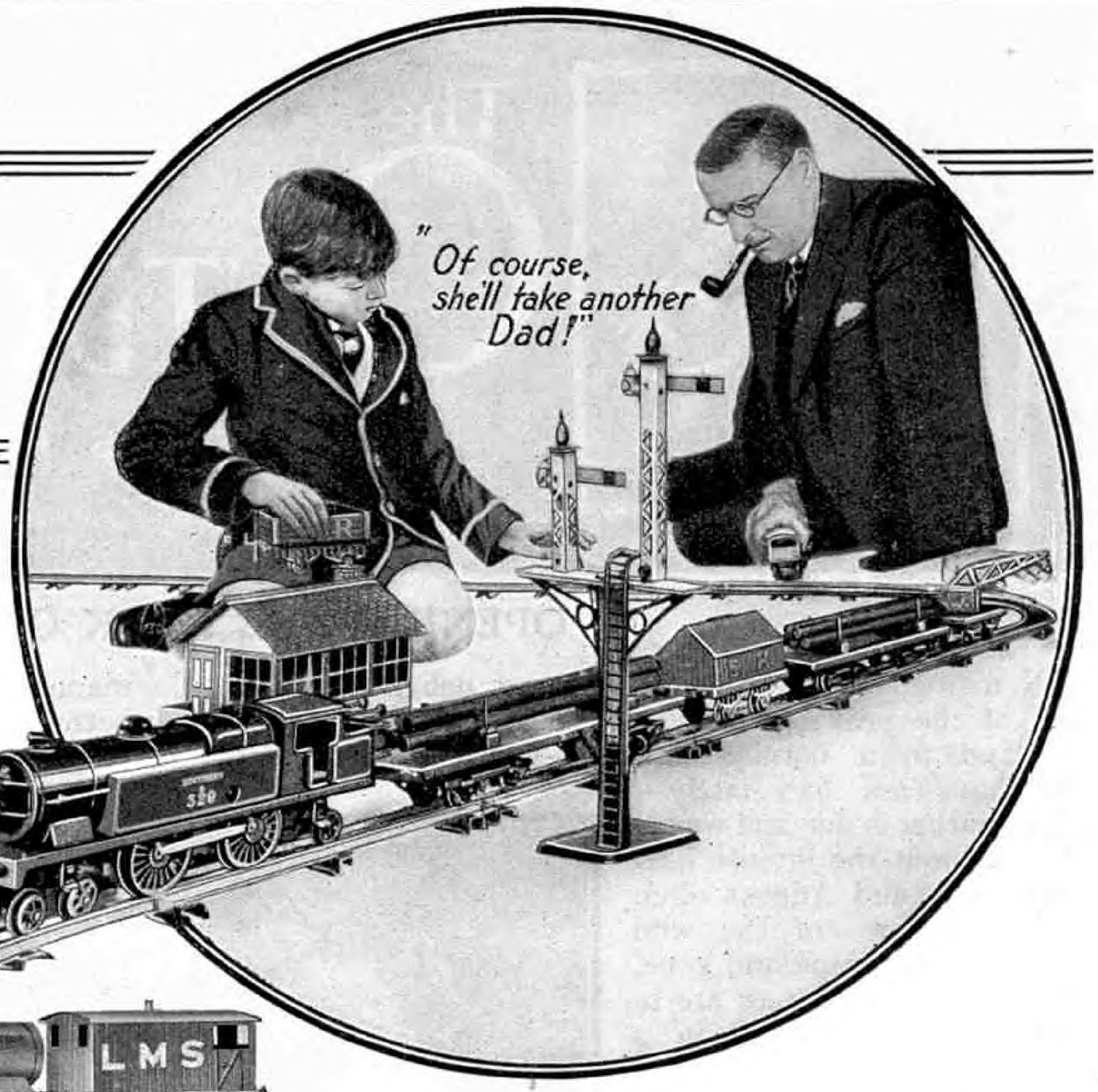
It is surprising how even a small amount of knowledge of some branch of natural history increases the interest in almost any ramble. It may be true in one sense that "a little learning is a dangerous thing," but it is also true that a little learning often leads to a little more, and finally to real knowledge. So long as the book of Nature remains closed it arouses little interest; but once the effort has been made to open it, even a little way, the riches within pour forth in an inexhaustible stream for those who remain to read.

Next month we shall point the way to the discovery of some of the hidden beauties of the outdoor world.

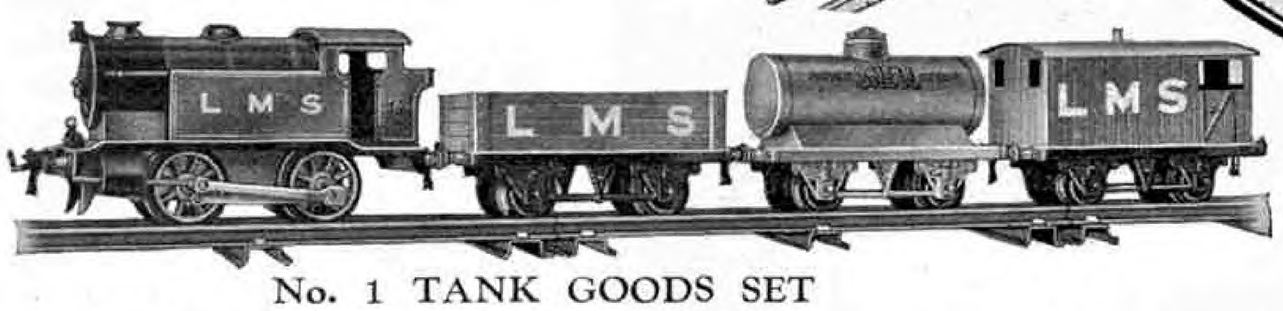
Longer Runs— with Heavier Loads

Hornby clockwork and electric trains are the best that you can buy. The Locomotives are built for heavy loads and long runs; the Rolling Stock is strong, smooth running and durable; the Accessories are realistic and correct in proportion. Every article is made of the finest material, by British craftsmen.

It will be a great moment in your life when you have a Hornby Train Set, and are able to play the great game of railways. Nothing could give you greater pleasure, there is no other game you'd be as keen to play.



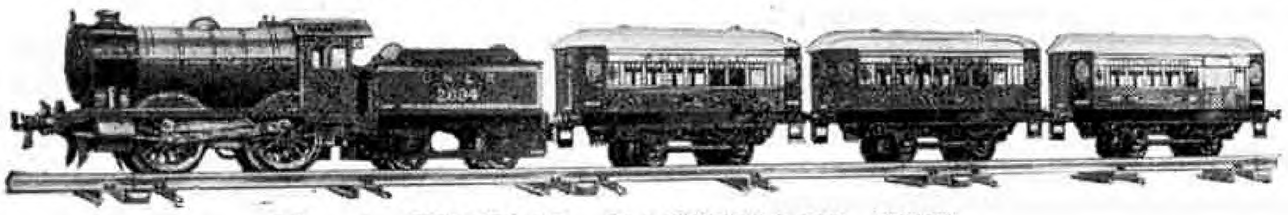
Tell Dad what you think of these fine models of modern engines and rolling stock. Tell him what every boy knows—that Hornby Trains are the best, strongest and most efficient model trains in the world!



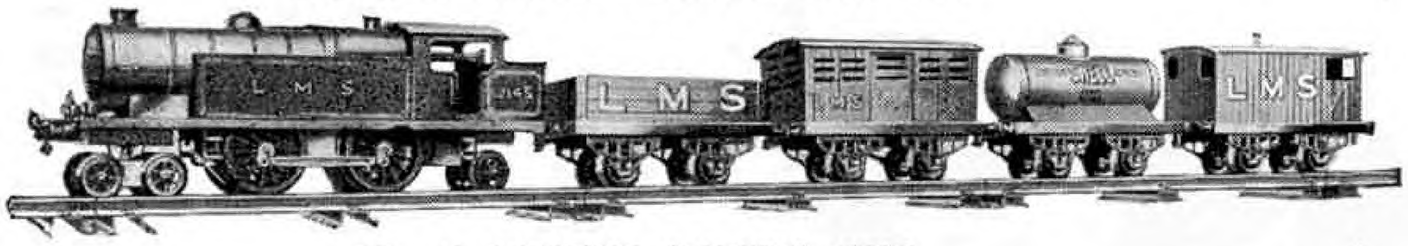
No. 1 TANK GOODS SET



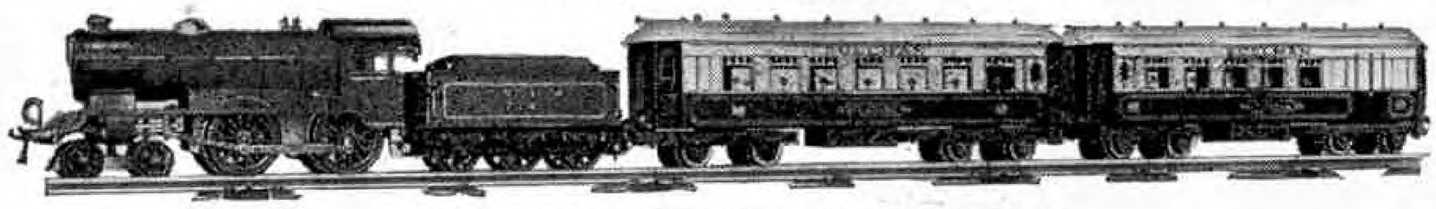
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No. 1 Special Passenger Set	35/-
No. 2 Mixed Goods Set	40/-
Metropolitan Train Set C	45/-
No. 3C Set Riviera "Blue"	62/6
No. 2 Special Pullman Set	67/6
No. 3C Pullman Sets, "Flying Scotsman," "Royal Scot," "Cornish Riviera," or "Continental Express"	67/6

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No. 3E Set Riviera "Blue"	80/-
No. 3E Pullman Sets, "Flying Scotsman," "Royal Scot," "Cornish Riviera," or "Continental Express"	85/-
Metropolitan Train Set L.V.	85/-

HORNBY TRAINS

BRITISH AND GUARANTEED

MANUFACTURED BY MECCANO LIMITED OLD SWAN LIVERPOOL



Branch Notes

WEST DULWICH AND HERNE HILL.—Sidings have been added to the layout and at certain meetings new members have been allowed to gain experience in the simple operation of trains, timetable working being suspended for the purpose. Other meetings have included an interesting lecture by Mr. E. P. Fisher, Chairman of the Branch, on the measures that have made travel on British railways safe, and a Branch library evening, when members read extracts from books on railway working. Secretary: J. Nunn, 70, Herne Hill, S.E.24.

NEASDEN.—Several experimental layouts have been tried and as train working was most satisfactory when double track was employed, no sections of single track are included in the layout now in use. The main terminal station is to be covered and visits are being made to London termini in order to study train operation and to obtain hints for realistic details to be incorporated in the Branch layout. There is room for more members, and a magazine will be produced when the Branch roll is more satisfactory. Secretary: J. V. Reynolds, The Grove, Neasden Lane, London, N.W.10.

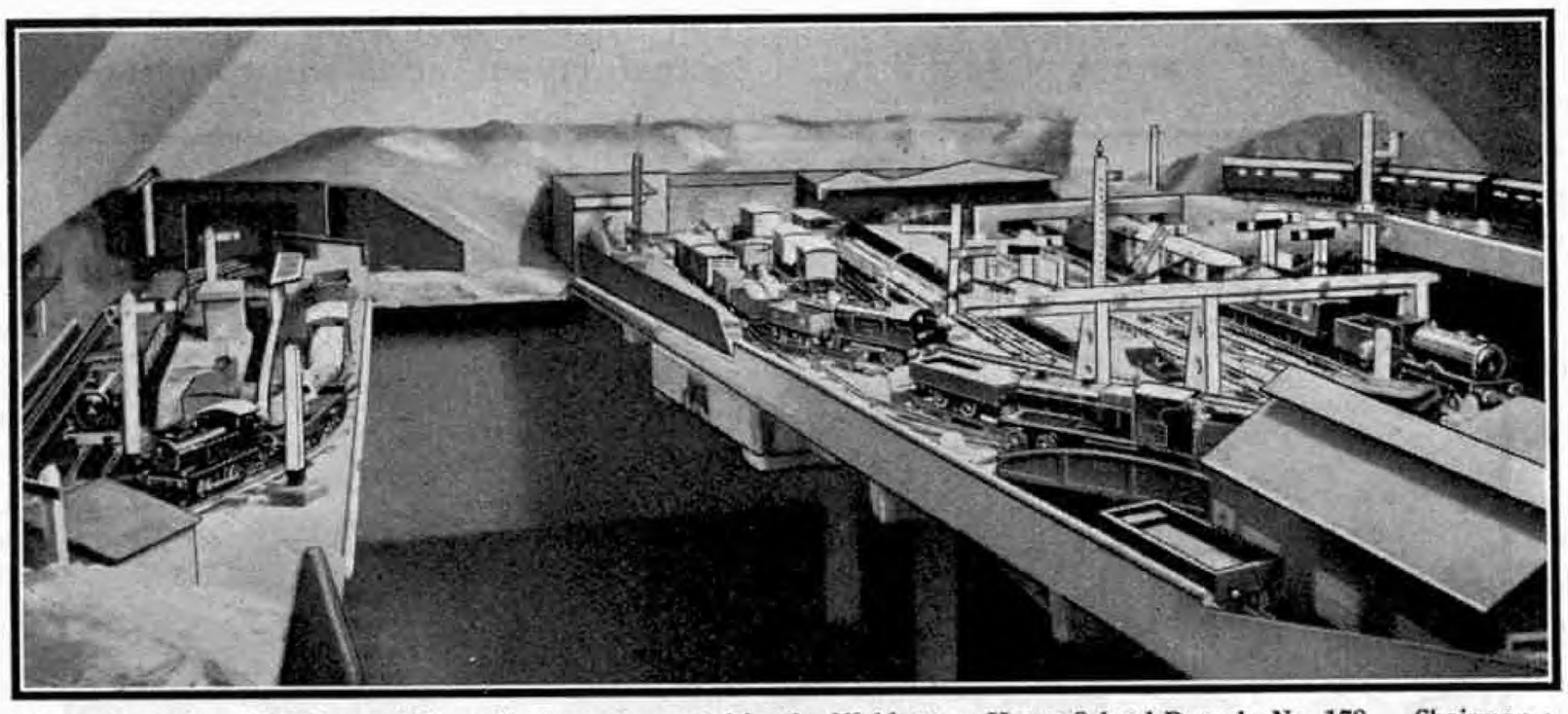
FLIXTON WESLEYAN.—Enjoyable track work has been carried out on the continuous layout with three sidings adopted after experiments with various types. A lecture on the Morse Code has been given by the wireless operator of a liner, and a visit paid to the sidings and signal cabin of the local station, the Stationmaster himself kindly acting as guide. Secretary: J. P. Haworth, "Woodthorpe," Rothiemay Road, Flixton, Nr. Manchester.

ASHLEIGH (BEXLEY).—At track meetings systems of operation leading up to regular timetable working have been devised and carried out. The most interesting recent event was a visit to the L.N.E.R. Locomotive Depot at King's Cross, where the repair shops were inspected. Members also examined a four-cylinder "Atlantic" engine, No. 3279, and other locomotives, and watched the operation of the coaling plant, being greatly impressed by the speed with which locomotive tenders were filled. Secretary: A. F. C. Harmer, "Ashleigh," Manor Way, Bexley, Kent.

WIMBORNE GRAMMAR SCHOOL.—The Branch rolling stock has been increased by the addition of a Fish Van, a Banana Van, two Tank Wagons and other vehicles, and regular working of goods trains is carried out. An electric light has been placed in the tunnel—for use in the event of accident!—and six additional signals have been installed in the Shunting Yard. Dilapidated wagons have been ruthlessly scrapped. It has been decided that at track meetings Stationmasters must only supervise, and they are made responsible for the training of their staffs. Secretary: J. K. Bennett, 120, Newington Causeway, London, S.E.1.

HEATH MOUNT.—The Certificate of Incorporation has been framed and hung up in the Branch room. Track meetings are well attended, absent members being fined and the money thus raised being devoted to the purchase of rails and points. The constructional articles in the H.R.C. pages of the "*M.M.*" are studied regularly, and the Branch track includes many structural features described in them. Secretary: J. S. Battersby, "Kingswood," Manchester Road, Fairfield, Manchester.

NORMACOT.—The Branch has now been thoroughly organised, committees having been appointed to deal with various details. The first regular meeting was a great success. Trains were run to a carefully planned timetable on a track representing the L.M.S. line from Euston to Liverpool, and interesting shunting operations were carried on with stopping goods trains at intermediate stations. These operations had to be conducted in such a manner that the miniature "*Merseyside Express*" was not delayed. Secretary: G. L. Shaw, 11, Hamilton Road, Longton, Stoke-on-Trent.



The main station, "Foxborough," on the layout operated by the Waldegrave House School Branch, No. 178. Chairman: Captain R. Montague Pope, M.A., T.D.; Secretary: P. D. M. Pope. The long tunnel seen in the background effectively masks the section of the main line that passes behind the station.

AUSTRALIA

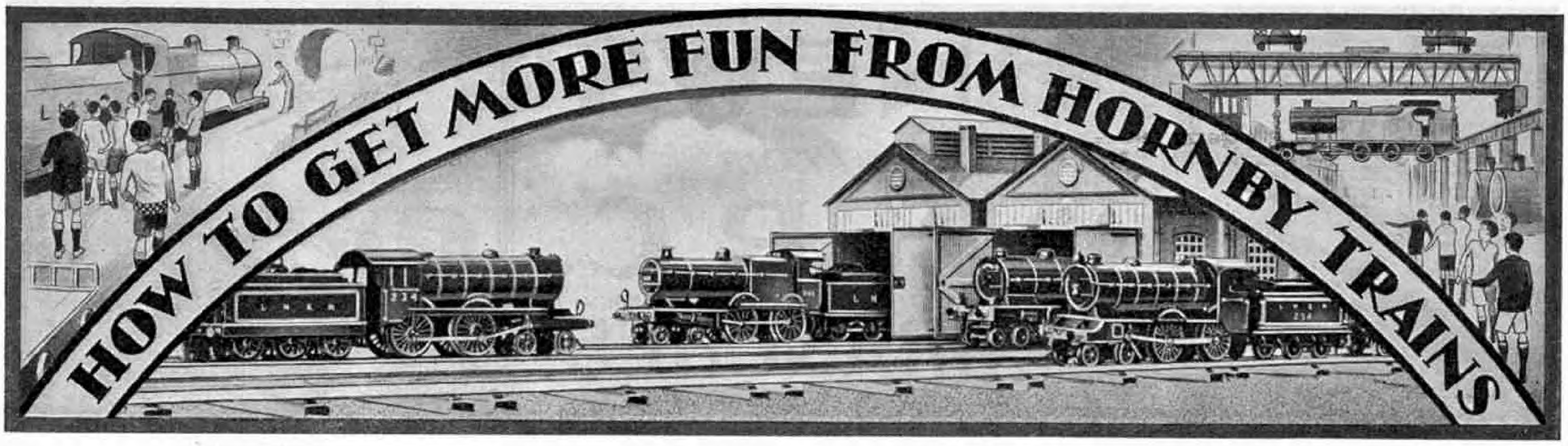
SYDNEY.—Regular track meetings have been held, and excellent work carried out on a non-continuous layout. A specially interesting event was a lecture by Mr. Jones on "*Early Australian Railways*," this being well illustrated by means of lantern slides and photographs. The Branch arranged a Hornby Railway Display at an Exhibition organised in aid of a fund for providing Christmas cheer for patients in the Sydney Children's Hospital. The extensive track was partly electrified and operations on it, and in the well-planned goods yard, aroused great interest among the 7,000 visitors. Interesting visits have been paid to the Locomotive Sheds at Eveleigh and the Gas Works at Mortlake. Single line working on a non-continuous layout with four loops and two terminal stations has proved very interesting at ordinary track meetings. Secretary: T. Watson, 595, Parramatta Road, Leichhardt, N.S.W.

Branches in Course of Formation

LEEDS—R. Bromby, 21, Alexandra Grove, Hyde Park, Leeds.
LEICESTER—H. Mansfield, St. Albans, Westminster Road, Stoneygate.
LONDON, S.W.12—J. D. Hulbert, 64, Sarsfeld Road, Balham, S.W.12.
LONDON, S.W.20—D. Fielden, 117, Bushey Road, Raynes Park, S.W.20.
PRESCOT—James Reynolds, "Nirvana," Eccleston Park, Prescot.
ROCHDALE—S. Dearden, 33, Moorland Avenue, Milnrow.

Branches Recently Incorporated

215. NEASDEN—J. V. Reynolds, The Grove, Neasden Lane, N.W.10.
216. NORMACOT—G. L. Shaw, 11, Hamilton Road, Longton, Stoke-on-Trent.
217. CANNOCK HOUSE SCHOOL—D. Wynbergen, Cannock House School, Eltham.
218. HEATH MOUNT—J. S. Battersby, "Kingswood," Manchester Road, Fairfield, Manchester.
219. FALLOWFIELD BAPTIST LIFE BOY.—H. Nelson Lightbown, 9, Albion Road, Fallowfield, Manchester.

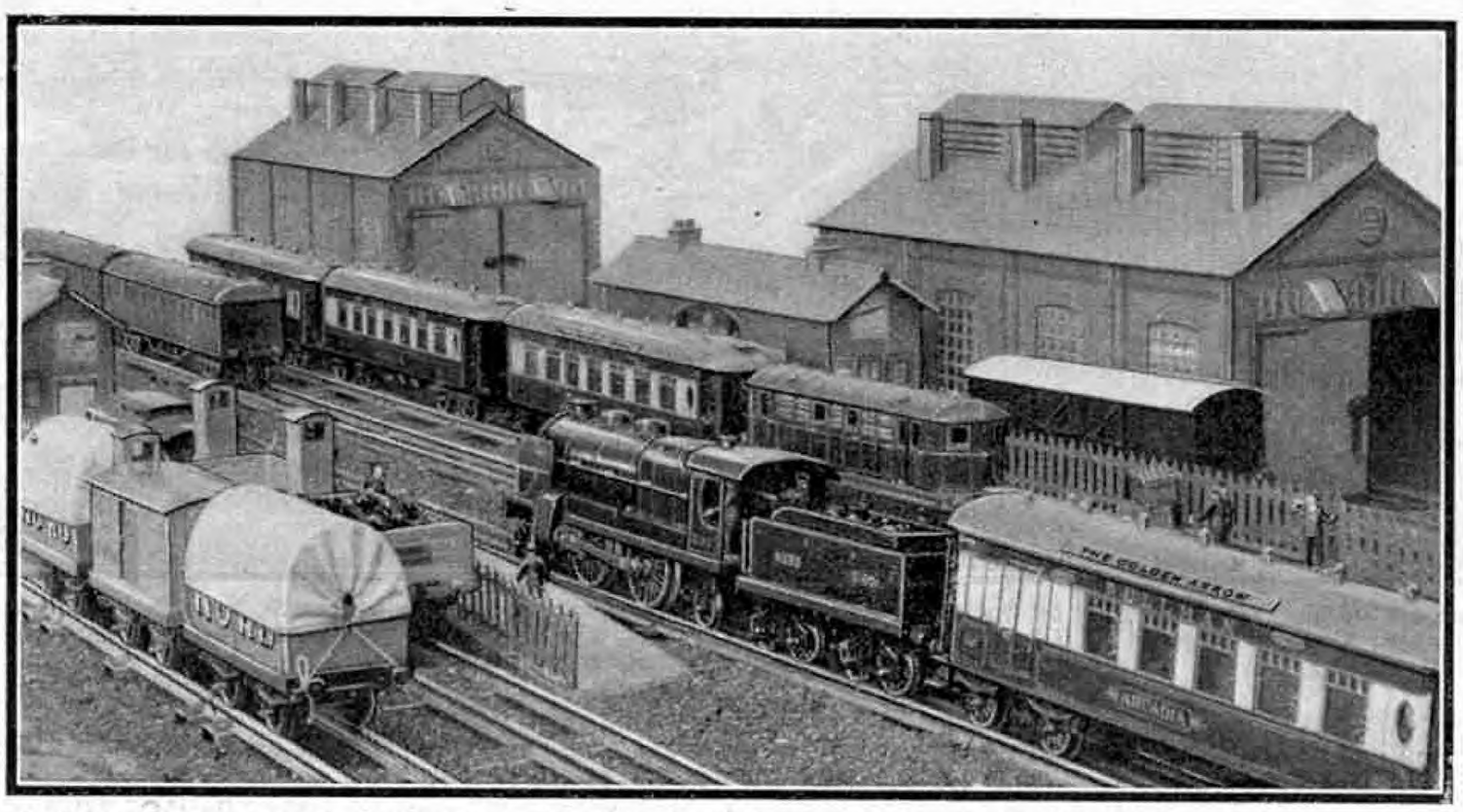


XLIV.—AN ANGLO-FRENCH LAYOUT

IF a miniature railway system is to appear like a satisfactory reproduction of the real thing, a consistent policy must be observed in regard to the various locomotives and rolling stock. Further, practices that do not exist in reality should not be allowed on a model railway, except where circumstances make them absolutely necessary. This is particularly the case where a certain group, or section of a group, is taken as a prototype. If, for instance, the locomotives and rolling stock used on a particular line are of L.M.S.R. type and colour, the observer is able to see at a glance which group is the railway owner's favourite, and therefore he can reasonably expect to find that the operation of the line generally will be conducted according to the practice of the real railway.

This does not mean that model railway owners should necessarily confine themselves to certain types of locomotives and rolling stock. There are many who are interested in railways in general, rather than in one group or section; and their ideas are expressed by the presence on their miniature railways of a miscellaneous collection of locomotives and coaches in the colours of various groups. Very often it is possible to explain the existence of this varied collection by "joint working" into a certain station, or over a particular stretch of line. There are many instances of this in real practice, and several examples have been mentioned in these pages from time to time. Other model railway owners go further, and plan their layouts to represent imaginary joint systems, thus making possible through services and connections of a particularly interesting character.

Striking developments of this idea are made possible from the fact that the Hornby Series includes examples of Continental locomotives and rolling stock. This opens up great possibilities, and directs attention to a scheme that was projected many years ago and has been revived at intervals since; namely, for a Channel Tunnel to afford through communication by rail between England and the Continent. Although this tunnel scheme has never materialised, and at present does not seem likely to do so, this need not hamper the model railway enthusiast. If he possesses both British and Continental type locomotives and rolling stock, and wishes to put into operation a reasonable scheme for using them, he may assume that the Channel Tunnel is constructed, and avail himself of it accordingly. The actual layout adopted will of course depend on the space and material available, and on the ideas of the individual operator. The scheme we are now going to describe is a general one that can easily be modified to suit almost any special conditions and requirements.



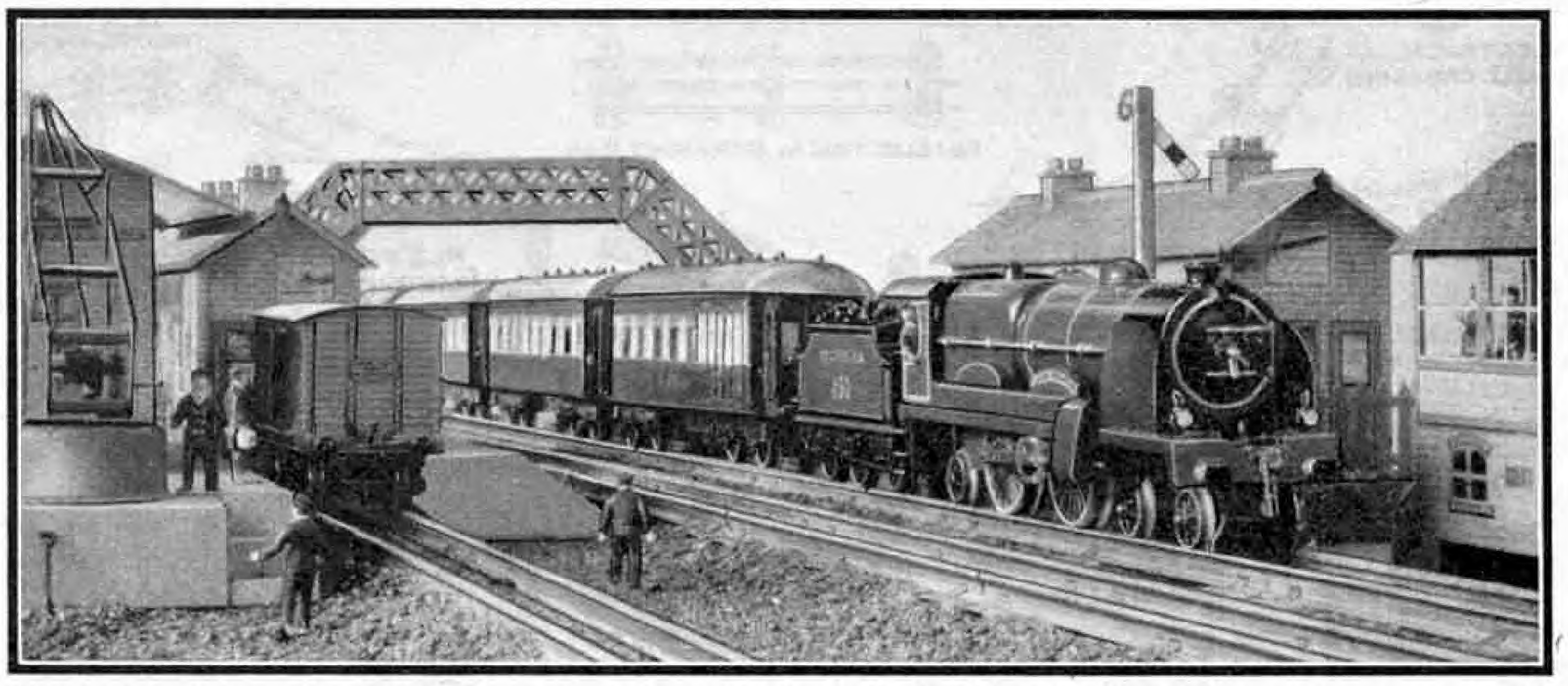
An interesting photograph showing part of the layout at "Calais" as described in this article. Pullman expresses are shown arriving from "London" and from "Paris," the former having negotiated the "Channel Tunnel" in charge of an electric engine.

We will assume that the Channel Tunnel itself runs between Dover and Calais, and that although this section is necessarily worked by electricity, the Southern Railway of England and the Chemin de Fer du Nord of France still retain steam locomotives for the haulage of the trains over their systems. The S.R. electrification scheme that is now being carried out to Brighton need not worry us, as we are only concerned with the Eastern section between Victoria and Dover. Therefore, such famous trains as the "*Golden Arrow*" can be operated on both sides of the Channel by Hornby steam-outline No. 3 Locomotives, the famous "*Lord Nelson*" being the S.R. engine, and the well-known "Riviera" Locomotive representing the "de Glehn" compounds that do such remarkable work on the Nord system.

The difference between the English and the Continental rail gauges is only fractional, so that vehicles built to British standards can be operated over French metals, as was the case during the War, when numerous English locomotives went across to "do their bit." As the Continental loading gauge is more generous than ours, however, vehicles for through services would have

to conform to our standards, unless a complete reconstruction of the S.R. were carried out. Assuming this question is settled in a satisfactory manner one way or the other, we make up the "*Golden Arrow*" for its through run from London to Paris, using Hornby No. 2 Special Pullman Coaches. These, of course, must bear the Name Boards with the title of the train upon them.

For the run to Dover, as mentioned previously, a Hornby "*Lord Nelson*" is employed. An up-to-date touch will be to fit the engine with smoke deflectors as suggested in these pages last month. One of the accompanying photographs shows a train on its way hauled by an engine so fitted, and the effect of the addition is very striking. As the locomotives are changed at Dover, the layout should be adapted to enable the operations involved to be carried out with the minimum of delay. This applies also to Calais, and in the photos shown that represent this station, the central road will be noticed to enable the various locomotive movements to be performed easily. This will be found very useful also in the carriage and wagon marshalling operations that will be required from time to time.

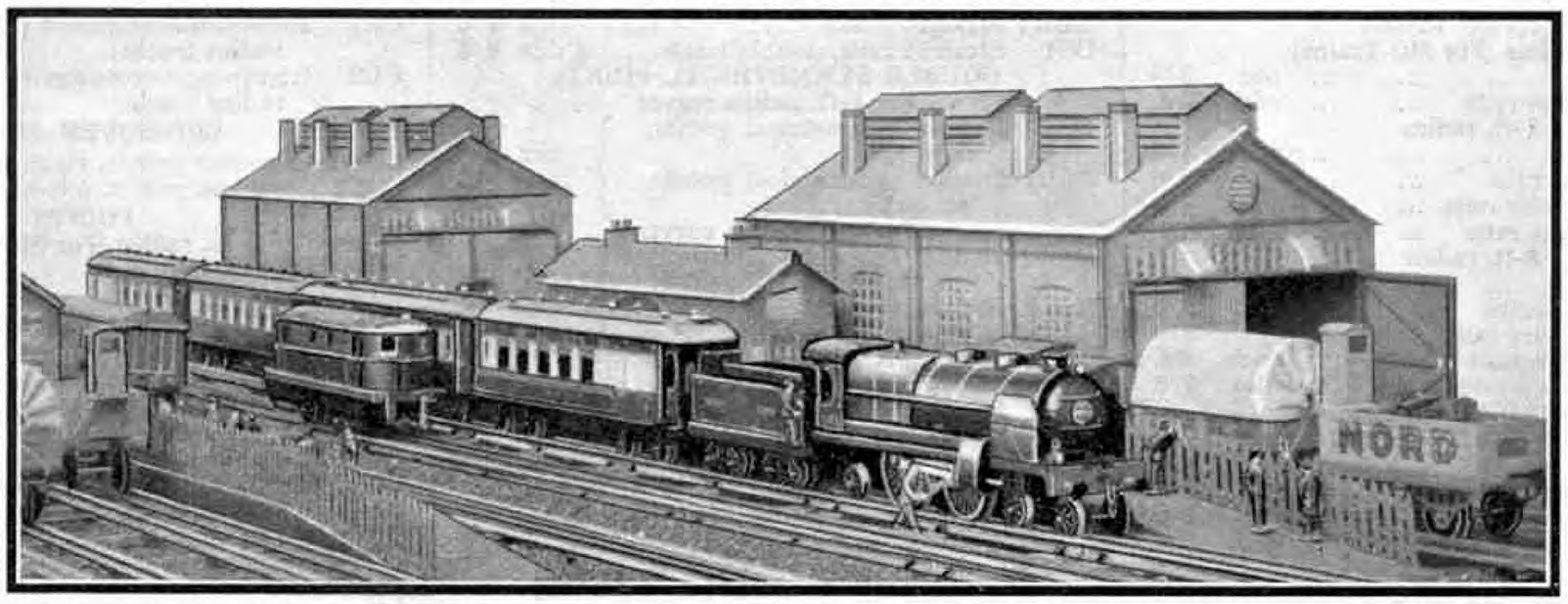


This photograph shows the "Golden Arrow" on its way to "Dover." For this first part of its through journey it is hauled by a "Lord Nelson" Locomotive fitted with smoke deflectors.

On arrival at Dover the "*Lord Nelson*" gives way to an electric locomotive, proceeds to the engine sheds, and waits for the arrival from the Continent of the train on which its return working will be made. An electric engine of the well-known Hornby Metropolitan type may be used for the next stage of the journey. This, we will assume, belongs to the Channel Tunnel Company, an international concern responsible for the operation of the tunnel section and therefore providing the motive power. Although it would be more realistic if an actual electric engine were employed, there is no reason why a clockwork-driven Metropolitan engine should not be used by those who prefer it, or who are unable to have an electrically-operated section. In either case an interesting step will be to fit up the coaches for electric lighting, as suggested recently in the Hornby "In Reply" columns. It is probable, too, that complete lighting would be installed throughout the tunnel, so that this also is a suggestion for those who decide to adopt the scheme.

The actual tunnel section might well be arranged as suggested in these pages in September last year, when the Metropolitan Railway and the reproduction of some of its chief features received attention. If a permanent layout on a raised structure is possible, the tunnel section might be fitted up on additional shelving underneath the main track. On the other hand, if a portable track is a necessity, such an elaborate scheme is scarcely possible, but the tunnel section may be arranged quite well if its presence is masked satisfactorily by the use of scenic and other effects. Individual enthusiasts will be able to decide upon the scheme to be adopted as a solution of the problem upon their own particular systems where special conditions may obtain.

After traversing the tunnel, the "*Golden Arrow*" regains the daylight at Calais, where the layout will most likely be similar to that at Dover. As a matter of fact, where space is limited and the layout has to be arranged on the oval continuous plan in order to obtain sufficient length of run, the train may be dealt with twice at the same station, representing Dover and Calais at successive stops. The Channel Tunnel Company's engine is then detached and proceeds to the depot or siding where it will lie by until a further turn of duty.



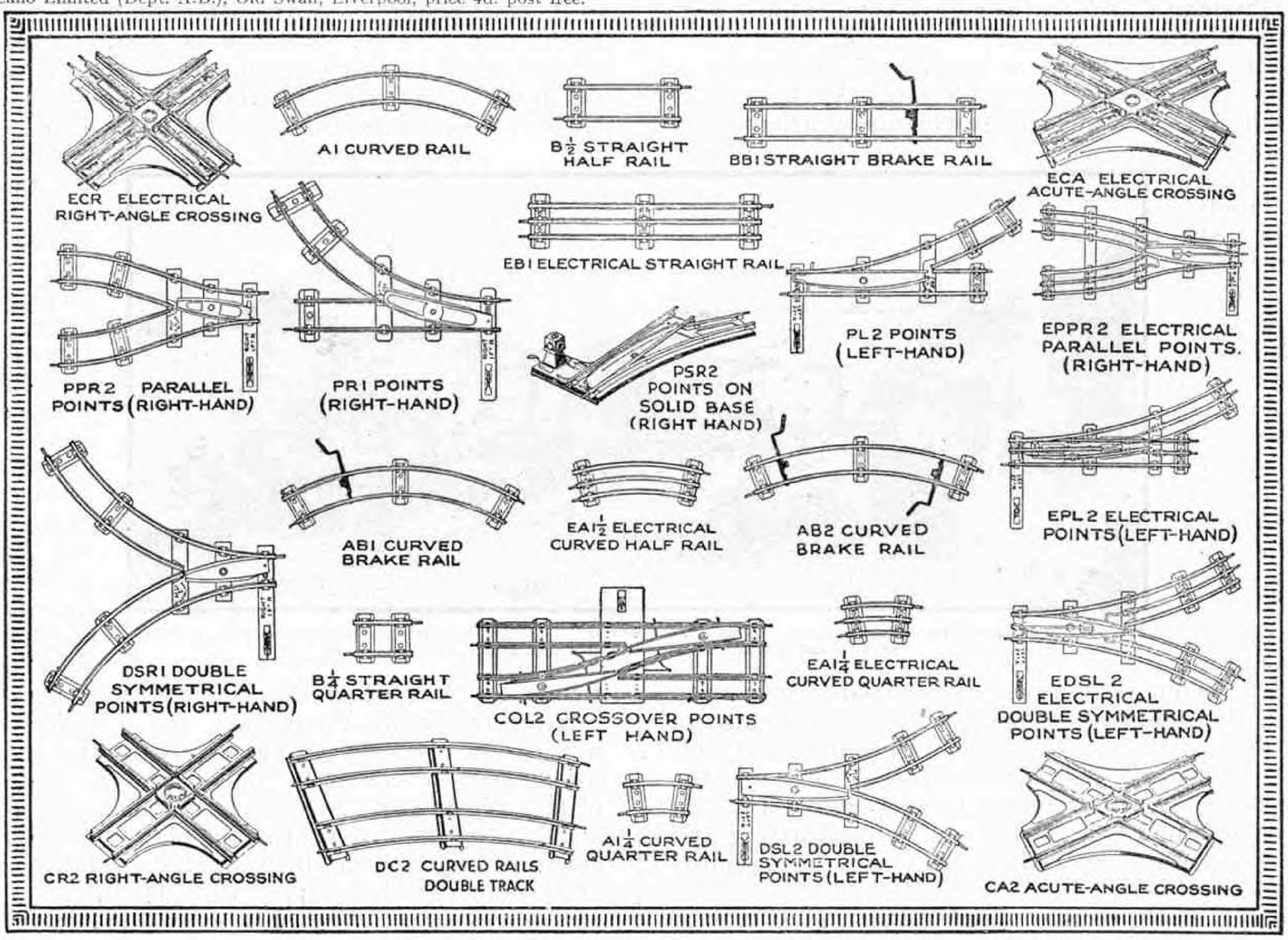
Another view of "Calais." The electric engine has been detached and is proceeding to its depot by means of the centre road while the "Nord" 4-4-2 makes ready to depart for "Paris."

The next engine to be used is the Hornby "Riviera" 4–4–2 which, with its brown colouring, large bogie tender and typical Continental boiler mountings, has a particularly fascinating appearance. This may be still further enhanced by the fitting of smoke deflectors. These are attached in the same way as on the Hornby L.M.S.R. and S.R. engines previously described, but the shape of the sheets, as shown in the accompanying photographs, is different in detail, the front top corners being cut off at an angle and the rear corners rounded. To complete the distinguished appearance that they give to the engine, they may be picked out as suggested in the illustrations, and the word "Nord" painted on them in small letters.

The journey to the French capital is then completed with the Nord locomotive in charge of the train.

Hornby Series -:- Rails, Points and Crossings -:- Hornby Series

Hornby Rails, Points and Crossings are designed to meet the most exacting requirements of model railway enthusiasts. The variety of Points, left-hand and right-hand turnout, together with the Crossings, make possible an almost endless number of realistic and railway-like layouts. The adaptability of the Rails, Points and Crossings is well shown in a special booklet "How to Plan your Hornby Railway," which is obtainable from your dealer, price 3d., or from Meccano Limited (Dept. A.B.), Old Swan, Liverpool, price 4d. post free.



Alternate Pegs

	CURVED RAILS		
	9-in. radius (For MO Trains)		
M9	Curved rails	doz.	3/–
MB9	Curved brake rails	each	3½d.
	1-ft. radius		
A1	Curved rails	per doz.	4/6
A1½	Curved half rails	„	3/6
A1¼	Curved quarter rails	„	3/–
AB1	Curved brake rails	each	6d.
	2-ft. radius		
A2	Curved rails	per doz.	4/6
A2½	Curved half rails	„	3/6
A2¼	Curved quarter rails	„	3/–
AB2	Curved brake rails	each	6d.
DC2	Curved rails, double track ...	½ doz.	7/6
	STRAIGHT RAILS		
BM	Straight rails (for MO Trains)	per doz.	2/9
B1	Straight rails	„	4/–
B½	Straight half rails	„	3/–
B¼	Straight quarter rails	„	2/6
BB1	Straight brake rails	each	5d.

Rails for Clockwork and Steam Trains

BBR1	Straight brake and reverse rails	each	1/6
DS1	Straight rails, double track ...	½ doz.	6/6
	DOUBLE SYMMETRICAL POINTS		
	For 1-ft. radius curves		
DSR1	Double symmetrical points, right-hand	per pair	5/–
DSL1	Double symmetrical points, left-hand		
	For 2-ft. radius curves		
DSR2	Double symmetrical points, right-hand	per pair	5/–
DSL2	Double symmetrical points, left-hand		
	PARALLEL POINTS		
PPR2	Parallel points, right-hand	per pair	5/–
PPL2	Parallel points, left-hand		
	CROSSINGS		
CA1	Acute-angle crossings (for 1-ft. radius tracks)	each	2/–
CA2	Acute-angle crossings (for 2-ft. radius tracks)	„	1/9

Gauge 0, 1¼″

CR1	Right-angle crossings (for 1-ft. radius tracks)	each	2/–
CR2	Right-angle crossings (for 2-ft. radius tracks)	„	1/9
	CROSSOVER POINTS		
COR2	Crossover points, right-hand	per pair	12/–
COL2	Crossover points, left-hand		
	POINTS		
	9-in. radius (For MO Trains)		
MR9	Right-hand points	per pair	3/–
ML9	Left-hand points		
	1-ft. radius		
PR1	Right-hand points	per pair	4/–
PL1	Left-hand points		
	2-ft. radius		
PR2	Right-hand points	per pair	4/–
PL2	Left-hand points		
PSR2	Points on solid base, right-hand	per pair	8/6
PSL2	Points on solid base, left-hand		
RCP	Rail connecting plates ...	½ doz.	2d.

Rails for Electric Trains

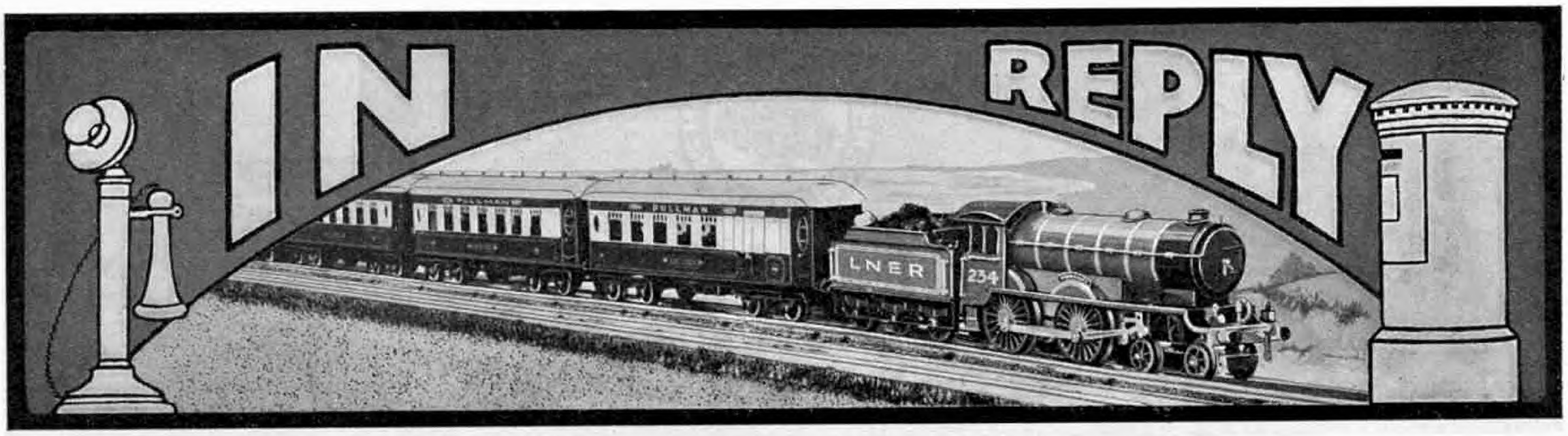
	CURVED RAILS		
	1-ft. radius		
EA1	Curved rails	per doz.	6/6
EA1½	Curved half rails	„	4/6
EA1¼	Curved quarter rails	„	4/–
	2-ft. radius		
EA2	Curved rails	per doz.	6/6
EA2½	Curved half rails	„	4/6
EA2¼	Curved quarter rails	„	4/–
EDC2	Curved rails, double track ...	½ doz.	9/–
	STRAIGHT RAILS		
EB1	Straight rails	per doz.	6/–
EB½	Straight half rails	„	4/6
EB¼	Straight quarter rails	„	4/–
EDS1	Straight rails, double track ...	½ doz.	8/6
	CROSSINGS		
ECA	Acute-angle crossings ...	each	4/–
ECR	Right-angle crossings	„	4/–
	POINTS		
	For 2-ft. radius curves		
EPR2	Right-hand points	per pair	7/6
EPL2	Left-hand points		
	DOUBLE SYMMETRICAL POINTS		
	For 2-ft. radius curves		
EDSR2	Double symmetrical points, right-hand	per pair	8/6
EDSL2	Double symmetrical points, left-hand		
	PARALLEL POINTS		
	For 2-ft. radius curves		
EPPR2	Parallel points, right-hand...	per pair	8/6
EPPL2	Parallel points, left-hand ...		
	CROSSOVER POINTS		
ECOR2	Crossover points, right-hand	per pair	24/–
ECOL2	Crossover points, left-hand		
TCPL	Terminal connecting plates (low voltage)	each	1/6

Electrical Points for 1-ft. radius curves are not supplied.

Centre Rails for Converting Ordinary Track to Electrical

	CURVED CENTRE RAILS		
	1-ft. radius		
AC1	Curved centre rails	per doz.	1/–
AC1½	Curved centre half rails ...	„	9d.
AC1¼	Curved centre quarter rails ...	„	6d.
	2-ft. radius		
AC2	Curved centre rails	per doz.	1/–
AC2½	Curved centre half rails ...	„	9d.
AC2¼	Curved centre quarter rails ...	„	6d.
	STRAIGHT CENTRE RAILS		
BC1	Straight centre rails	per doz.	1/–
BC½	Straight centre half rails ...	per doz.	9d.
BC¼	Straight centre quarter rails ...	„	6d.
ICR	Insulators for insulating centre rails	per doz.	3d.
CCR	Clips for fixing centre rails ...	„	6d.

Manufactured by MECCANO LIMITED, OLD SWAN, LIVERPOOL



Suggested Hornby Train Improvements

RAIL MOTORS

We have referred on several occasions to the possibilities of branch line working on model railways, and given hints as to the best schemes of operation. Several readers have sent in suggestions recently for the addition to the Hornby Series of steam rail cars, of such types as the "Sentinel-Cammell" and "Clayton" steam coaches. These are certainly used to a certain extent on our railways, but they cannot yet be considered to be in general use, and therefore Hornby models are not likely to be introduced in the near future. In the meantime, it is quite possible for Hornby Railway owners to construct a good rail car model from existing material.

The necessary components are a Metropolitan Coach with guard's and luggage accommodation and a Tank Locomotive of the former No. 1 type, which may have been replaced by an engine of more up-to-date pattern. These we proceed to modify in a few details, and finally couple them up to form a striking and useful unit for branch line traffic or for serving suburban stations between the "rush periods" when the normal train service is thinned out somewhat. As thus made up the rail motor reproduces the type of vehicle in which the coach may be permanently coupled to, or incorporate a steam locomotive of small proportions. Considerable attention has been devoted to them in actual practice at various periods, and they are certainly very effective for model purposes.

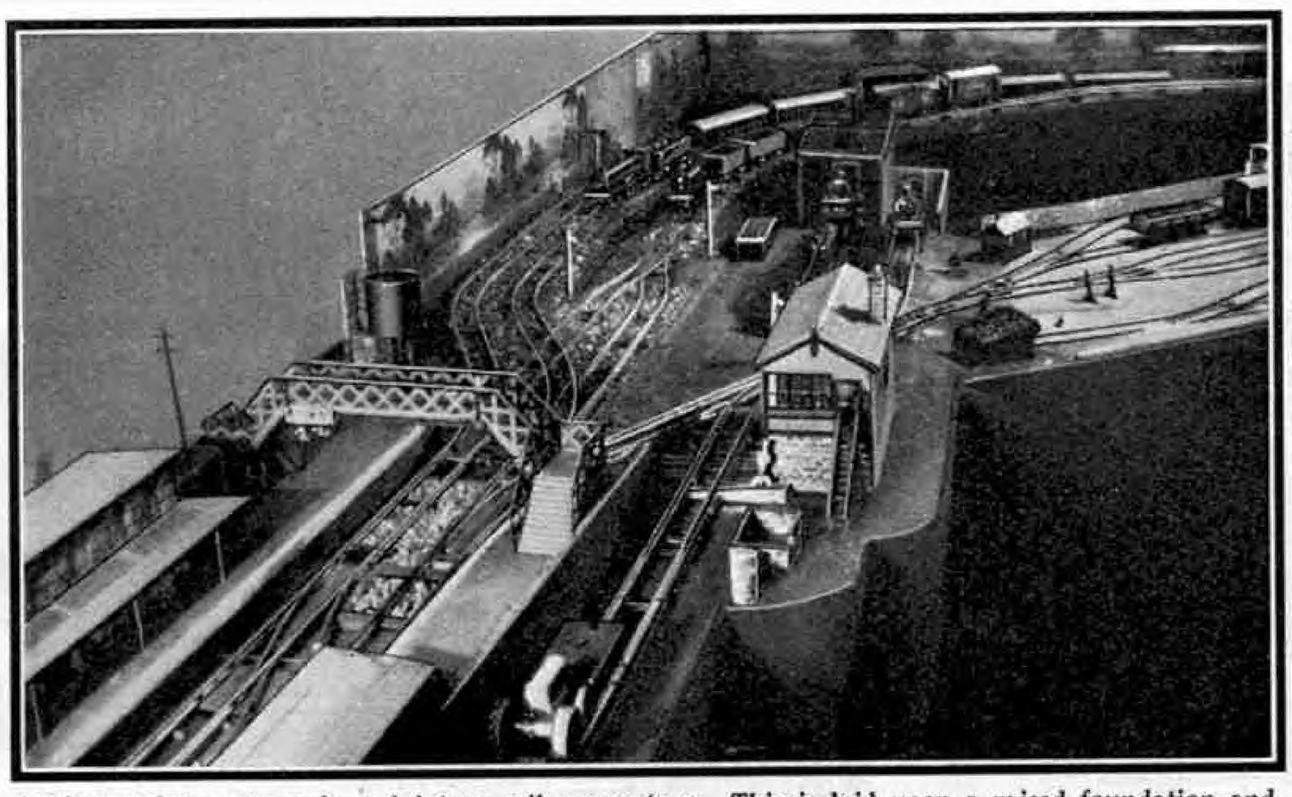
The work is simple. The coach roof is removed by unscrewing the four brass ventilators. The bogie at the end remote from the guards' compartment is removed and the couplings and buffers are taken off. With the removal of the buffers, the coach end will be free, and this should be replaced back to front so that the turned-up tongue of metal at the bottom, on which the coupling was fixed, points outward. Ordinary Meccano Nuts and Bolts are used to secure the end in place of the buffers that have been taken off. The metal tongue just referred to is now gently bent out flat with pliers, so as to be level with the floor of the coach. The underframe truss rods or tie bars are now moved from their original position in the centre of the coach so as to be near the end where the bogie has been removed. The bolt holes on each side opposite the bogie pin hole are exactly in the right place to allow the truss rods to be attached in their new position without trouble. This being done, the coach roof may now be replaced.

The Locomotive now requires attention. The buffers and the coupling at the rear end are removed, and the bunker back and cab roof are taken off after prizing up the lugs securing them. The knobs on the brake and reverse rods are removed, and by means of judicious bending, the rods themselves are caused to project sideways through the upper part of the openings in the cab sides. Care must be taken to see that the operation of the controls is not impeded. This arrangement of the rods is necessary because, when the unit is assembled, the Coach is very close to the rear of the engine. The brake rod will of course project on the left-hand side, and the reverse rod on the right.

The after parts of the bunker side sheets are now bent at right angles, the bend being made so that the lugs securing the bunker to the frames at this point are intact, the angle of the bend corresponding with the end of the lug. Some careful cutting of the frame of the engine is now necessary in order to shorten it at the rear end. The buffer beam is flattened out, and a cut is made along the bend in the side of the footplate until a point $\frac{1}{8}$" behind the now shortened bunker is reached. The turned-down portion of the frame is removed so that we now have the flat floor and buffer beam projecting, and these are cut off.

The Locomotive and the Coach may now be coupled up. The projecting tongue on the end of the coach passes under the frame of the engine and by fitting a Meccano Pivot Bolt through the coupling hole in each the two are joined. The tongue will be lower than the engine frame, and a short length of spring with two washers will allow for this, and for any relative up-and-down movement. The coach is adjusted for height by washers underneath the tongue, lock nuts being finally fitted for security.

Readers who carry out this conversion will notice that the bunker back has not been replaced. This is hardly necessary as the engine is very close to the coach, but those who wish to may solder or Seccotine it on again, a slot having been cut centrally in its lower edge to accommodate the Bolt head over which it will pass. The completed unit is now ready to run and will traverse 2 ft. radius curves and points quite satisfactorily.



An interesting corner of a miniature railway system. This is laid upon a raised foundation and some interesting effects in scenery and accessories are incorporated.

REPRODUCING PULLMAN DETAILS

All readers are familiar with the Hornby No. 2 Special Pullman Coaches that reproduce in such a satisfactory manner the characteristics of the real vehicles. Pullmans are now in extensive use in this country. They were introduced in 1874 on the former Midland Railway, but the early vehicles, although a notable advance upon the ordinary coaches of the day, could scarcely be compared with the accommodation afforded in the magnificent Pullman saloons of to-day. These are luxurious steel panelled vehicles, and it is this type of coach that the Hornby Pullmans so satisfactorily represent.

There are, of course, a large number of earlier Pullmans in use in which the vertical matchboarding of the wooden lower panels is a feature, and some enthusiasts have expressed a wish that we should reproduce this panelling and several other features by means of transfers. We are not likely to take this step owing to the expense that would be involved in the preparation and application of the necessary transfers, but the following hints may be of use to those who are prepared to take a little time and care in order to attain the desired effect.

The lining on the lower panels of the real vehicles of matchboard construction has the appearance of being broken up by the joints in the boards when viewed at certain angles. This effect can be readily obtained with the Hornby No. 2 Special Pullmans, patience being the chief requirement rather than skill. The lower panels should be faintly marked in pencil with vertical divisions 3/32nds of an inch apart, taking care that the vertical parts of the gold lining do not correspond with the markings. If carefully done the latter will come nicely between the lines.

This being done, a T-square is applied to the lower edge of the coach side, the blade passing upward across it. Fine lines are now carefully drawn from the waist rail to the bottom edge of the coach with Indian ink. These lines will cut through the horizontal lining, of course, and if drawn sufficiently finely, they may be carried through the crests and the name panel transfers. A ruling pen is desirable for this work, but quite good results may be obtained with a mapping pen, or even an ordinary fine nib. Where the latter are used it may be better not to run the lines across the crests and name panels, for the line may come out too thick, but this depends upon individual choice and ability. When this has been carried out on both sides of the coach a very pleasing reproduction of the matchboard effect will be obtained.

Indian ink is again required for another little task that is quite worth the trouble. The raised beadings that are neatly carried out on the Hornby Pullman sides, and round the windows, may be very much improved if their edges, both vertical and horizontal, are thinly lined; this gives a shadow effect that results in the beading being thrown into sharp relief in a very striking manner. The appearance of the characteristic large oval windows in the vestibule also is improved if their raised frames are carefully painted with gold paint, and this should be applied to the two horizontal bars across them. The final touch is to apply gold paint to the vestibule sides immediately below the door openings, thus giving a gold strip about $\frac{1}{8}$" wide that has the appearance of a brass-bound step into the vestibule.

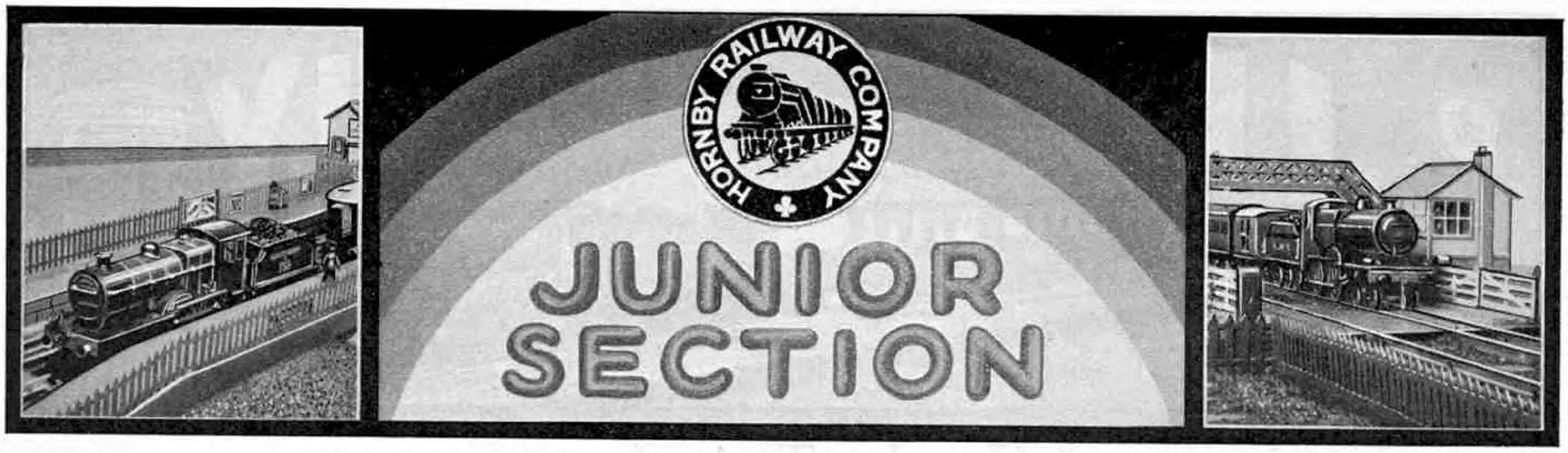
The general effect of these improvements is surprisingly attractive, and the owner of several Pullmans is not likely to be satisfied until he has finished each one of them in a similar manner.

BRAKE AND REVERSE RAIL FITTED FOR CONTROL.—This suggestion has been put forward several times, but we scarcely think that a great demand would be experienced for such an accessory. It would certainly be convenient to be able to brake or reverse the locomotive from the lever frame, but the fact that the engine when once stopped would have to be re-started in the usual way reduces the practical advantage of the scheme. (*Reply to H. Dodd, Bulwell.*)

L.N.E.R. ARTICULATED BOOSTER LOCOMOTIVE.—A model of this latest L.N.E.R. development would certainly be novel, but there are considerable difficulties in the way of manufacture. In addition, as the type is not yet typical of British practice, only a small demand is likely, but if such engines become more common their introduction would be considered. (*Reply to V. Swinstead, Durham.*)

SNOW PLOUGH FOR ATTACHMENT TO LOCOMOTIVES.—These fittings vary in shape and size, and a standard design would scarcely be satisfactory. The practical value of such an accessory is small, and those who require a snow plough of this kind may construct one from cardboard or tinplate. (*Reply to F. Smith, Hawick.*)

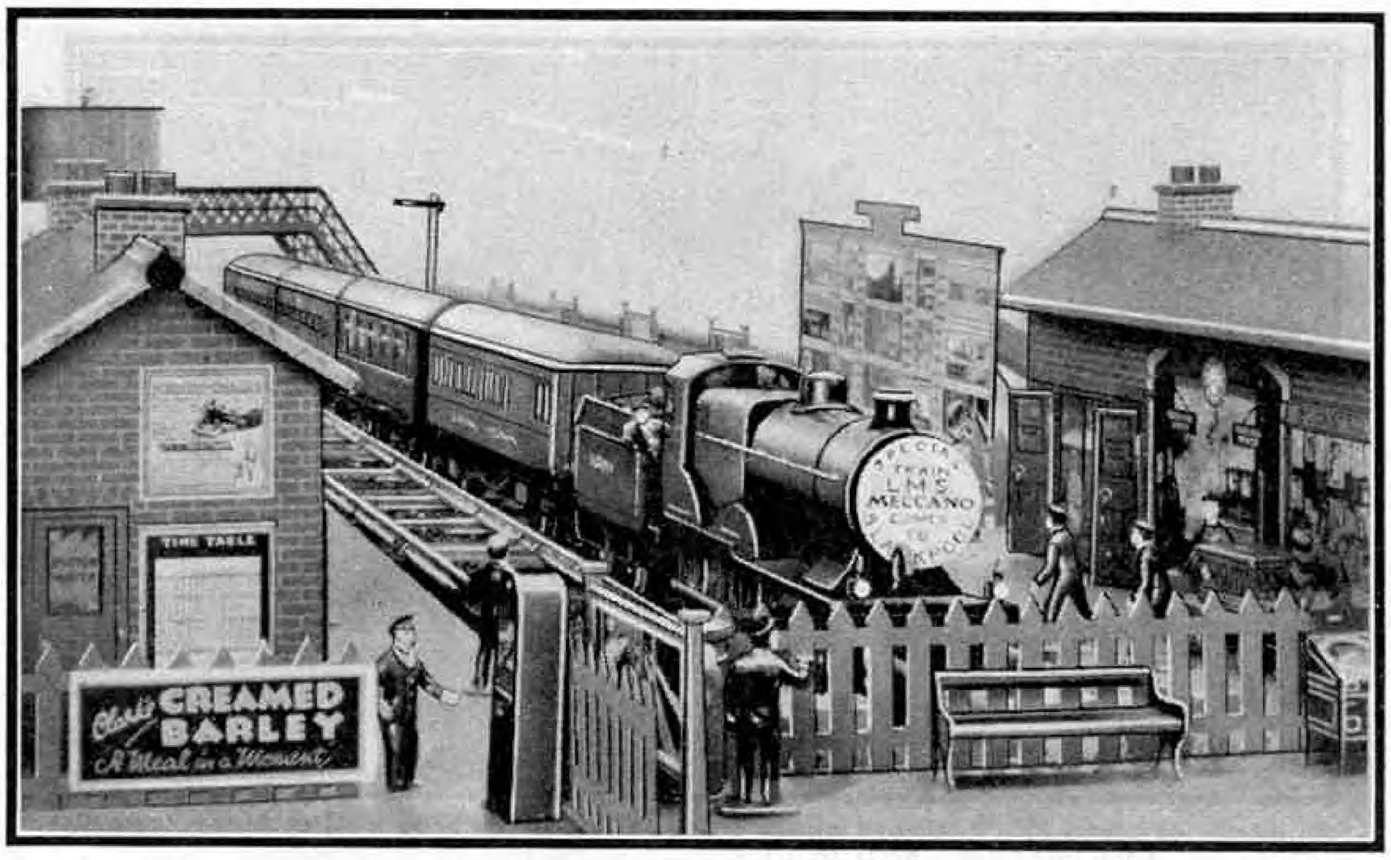
YELLOW DISTANT SIGNALS.—We have already considered the introduction of distant signals with yellow arms and with an orange spectacle glass in place of the usual red one. This scheme of yellow indications is undoubtedly coming into general use, and before long we shall probably take the matter in hand. (*Reply to R. Massam, Warwick.*)



XLII.—TOPICAL TRAIN SERVICES

FROM time to time we have made suggestions in these and the "How to Get More Fun" pages regarding layouts representing portions of various actual systems, and the train services that may be operated on them by means of Hornby Locomotives and Rolling Stock. These suggestions are usually found very welcome by our readers, particularly those who favour the practice of a certain group or section, but who live a long way from it, or at any rate from its main lines. They are thus hardly able to form a true idea of its chief characteristics.

With the approach of the summer months the question of holidays naturally demands more and more attention. The railway companies are making great efforts to attract all the traffic possible, and some remarks upon holiday traffic in general will be of interest. "See Britain First" is a familiar exhortation, and the railways certainly do their share in inducing people to travel in their own country, and in order to avoid excessive pressure in August, to take their holidays as early as possible. Hornby Railway owners who favour the various suggestions made in this article will be well prepared to reproduce on their own lines some interesting operations if a wet afternoon should put a stop to the outdoor activities customary at this time of the year.



The arrival of a "special" at a miniature terminus. Numerous trains of this kind are run for different occasions and their purpose and destination are frequently indicated in the manner shown.

The Great Western Railway demand particular attention for they have long claimed to be "The Holiday Line." Their enterprise in providing speedy services to the West generally has resulted in their chief trains becoming extremely heavy, and in order to keep time in these circumstances the engines are of the most advanced design. Taking this point alone, the Hornby Railway owner who favours the G.W.R. is very fortunately situated, for both the "*Caerphilly Castle*" and "*County of Bedford*" Locomotives of the Hornby Series are fitted with the latest improved mechanisms. They can haul heavy trains, and are capable of running long distances at satisfactory speeds as do their G.W.R. prototypes, provided, of course, that the usual attention is given to locomotives, track and stock to secure the best running. Their typical Belpaire fire-boxes, domeless boilers surmounted by safety valve casings, and other features, make these engines as distinctive among miniature locomotives as are the productions of Swindon in actual practice.

Of the many well-known trains operated by the G.W.R., the "*Cornish Riviera Express*" and the "*Torbay Limited*" have the most imposing titles. These are therefore included in the series of Hornby Train Name Boards, so that miniature reproductions of these famous expresses may be properly indicated. Of the more ordinary express trains—as far as such a term applies to the speedy Great Western services—those serving "Paddington, Exeter and Plymouth" and "Paddington and Bristol" can also be run correctly labelled, for these destinations are available.

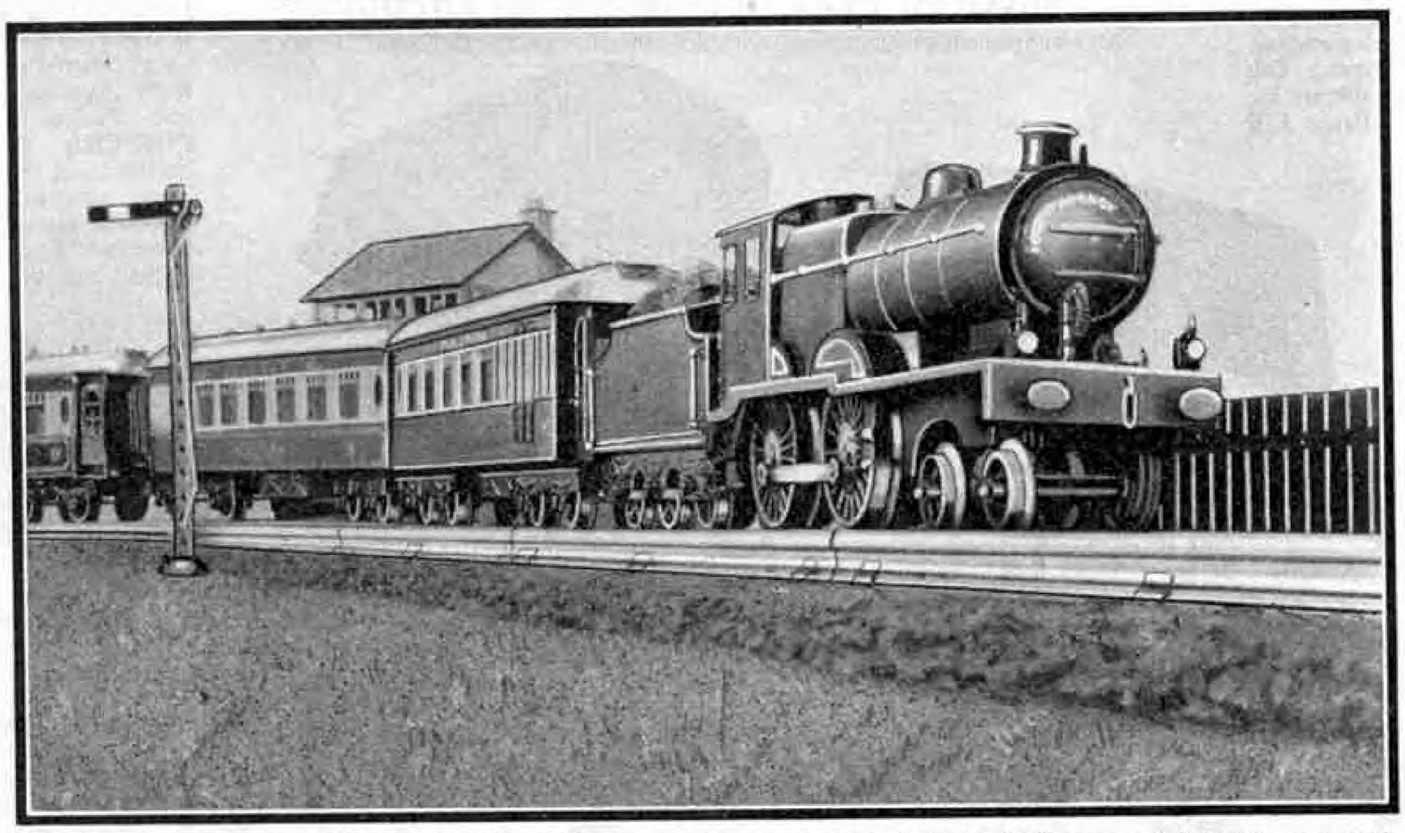
The "*Cornish Riviera Express*" is so well known that little further reference to it is necessary. A layout can hardly be considered to represent the G.W.R. main line to the West that does not include a miniature "Limited," as the Great Western men call it, among the trains operated over its tracks. A very interesting account of the train is given in Mr. C. J. Allen's book "*Famous Trains*," to which those requiring information should refer. An interesting possibility for experiment will probably occur to those who desire to run their miniature trains in such a manner as to reproduce as far as possible the operation of the real one. This is in connection with the practice of carrying "slip" portions for different destinations, which are detached without stopping at various junctions—in the case of the "Limited," at Westbury, Taunton and Exeter. As this practice is not nearly so common now as it once was, a special device in miniature would be out of the question, but we

are sure that many ingenious readers will see what they can do in the matter. Individual operators have their own ideas, and what may be considered a suitable method on some layouts would hardly fulfil the conditions of others.

Then in the case of a miniature "*Torbay Limited*," additional interest is afforded by the fact that the train is made up of articulated stock—an introduction that occurred rather suddenly on the G.W.R. in 1925, although the principle had long been employed on the L.N.E.R. The scheme mentioned recently in the "*M.M.*" for the articulation of Hornby No. 2 Saloon Coaches may be employed for the similar No. 2 Pullmans that we may use to represent G.W.R. stock. Where readers are keen on having details as correct as possible, a suggestion is to point out the "Pullman" transfer and crests appearing on the lower panels of these vehicles. This may be done easily, using brown enamel of a suitable shade. The coaches then, with their cream upper panels and roofs, gilt waistline and window frames, and plain brown lower sides, will look distinctive and reproduce reasonably well the G.W.R. coach livery.

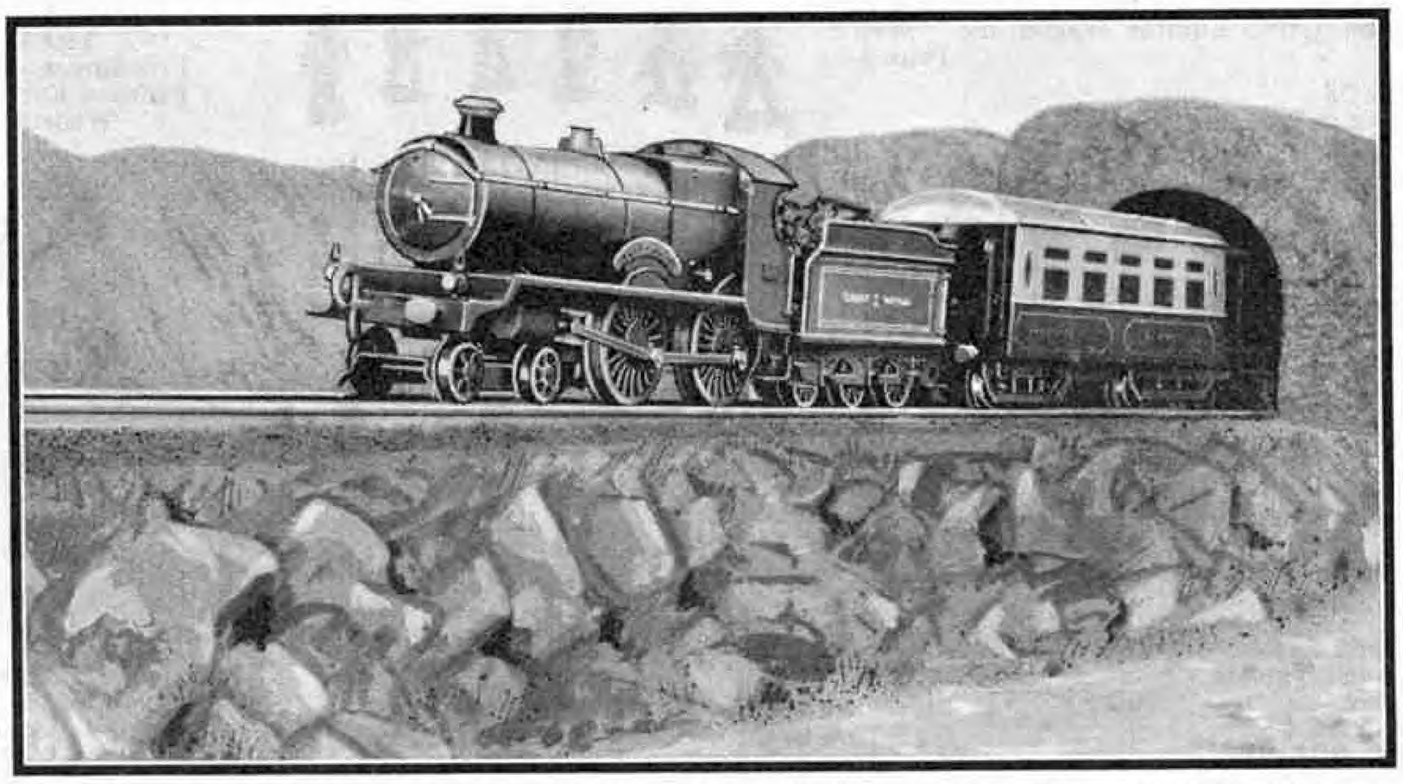
The Roof Clips should be attached to the coaches, and if these are painted brown also this will be an additional characteristic. One of the accompanying illustrations shows vehicles dealt with in this manner, the train representing the "*Torbay Limited*" running on the section of line between Dawlish and Teignmouth. This runs along the edge of the sea, and the reproduction of this and a few other features as far as possible, will be found very fascinating, and will add considerably to the true-to-type character of the system. The use of Hornby Cuttings and Tunnels as shown in the photograph referred to gives a very effective result and obviates the necessity for the home construction of these features, which in a portable layout is something of a problem.

Followers of the Southern Railway will urge that their line, too, deserves attention in connection with holiday transport. This is certainly so, as a visit to their London termini during the summer months will speedily show. The Western Section traffic from Waterloo is heavy and to a certain extent competitive with the G.W.R., the "*Atlantic Coast Express*" being the principal S.R. morning train to the West. In this case also the necessary Name Boards are available in the Hornby Series, so that this great train may be represented on a layout. In addition, a miniature "*Bournemouth Belle*," composed exclusively of No. 2 Special Pullman Coaches with the appropriate title applied, will give an air of distinction to any line that favours Southern practice.



A Pullman express on a Hornby Southern Railway. This is typical of many trains operated in real practice and the No. 2 Special Pullman Coaches and the Locomotive are excellent reproductions of their prototypes.

The Kent coast traffic gives S.R. officials something to cope with, and in running such trains in miniature the Hornby No. 2 Special Locomotive, which is a true-to-type reproduction of the real "L1" class engines, comes into its own. One of the accompanying photographs shows an engine of this type dealing with a heavy Pullman train, for the Southern Railway operate a large number of these vehicles. For handling exceptional crowds, tempted no doubt by cheap bookings and special facilities, suburban stock may be pressed into use during the times of heavy traffic. In this connection it would be distinctly interesting to use a "set train" of No. 1 Coaches, close-coupled as suggested last month. Such a train would form a useful unit for dealing with the traffic, as the carrying capacity is large in proportion to the length and weight of the train. The running qualities would naturally be improved by the fitting of Mansell wheels, though with suitable lubrication the pressed steel type are quite satisfactory. The permanent coupling, and therefore the operation of such a train as a complete unit, makes it easy to handle at terminals, and where trains follow each other at short headways—as they must do at busy times—this is a valuable feature.



An interesting touch is given by this photograph. Hornby Cuttings and Tunnels are effectively used and the train is represented as running along the edge of the sea.

There is naturally a great deal of scope for the running of numerous "specials," "second portions" and "reliefs," and the various means adopted of indicating these trains for the guidance of the staff have been referred to several times in the "*M.M.*" Trains run in connection with topical events at seaside towns may be operated, and imagination may be brought into play here to devise reasons for them and to arrange suitable decorations for the engines employed. Although it is customary to take a bold line in this direction in these times, care should be taken not to overdo such effects.

HORNBY ACCESSORIES

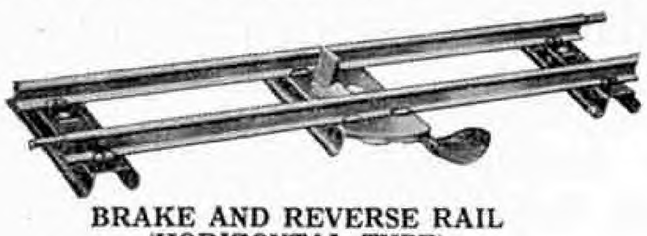
HORNBY SERIES

GAUGE 0

The range of Hornby Accessories, already comprehensive, has now been increased by the addition of a number of splendid new items. A selection of these is illustrated and described below. If you are a Hornby enthusiast you will appreciate at once the extent to which the new Tunnels, Cuttings, etc., will enhance the realism and effectiveness of your Hornby railway layout.

Tell your dealer that you want to see these new goods as soon as he has supplies available.

MECCANO LTD., OLD SWAN, LIVERPOOL



BRAKE AND REVERSE RAIL (HORIZONTAL TYPE)
This special rail is designed on an entirely new principle. It has independent catches for reversing or stopping the train. These are operated quite simply by means of one control lever. Price **1/6**



TUNNEL No. 0 (Straight)
Length 6 in., width 6⅛ in.
Price **1/6**

TUNNEL No. 1 (Straight)
Length 7 11/16 in. Width 6¼ in. (as illustrated).
Price **2/-**

TUNNEL No. 2 (Straight)
Length 15⅝ in. Width 9½ in. Price **4/-**



TUNNEL No 3. (Curved)
Length 13 in. Price **4/6**

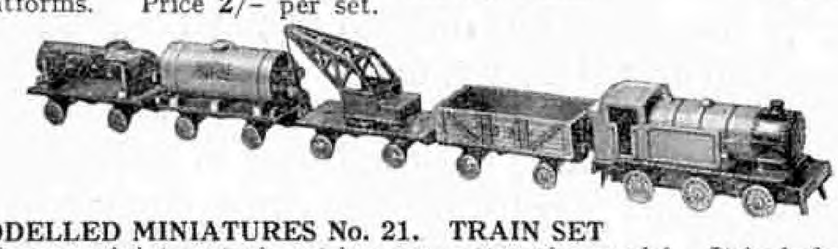
TUNNEL No. 4 (Curved)
(as illustrated)
Length 20 in. For 2 ft. radius tracks only. Price **5/6**



MODELLED MINIATURES No. 1 STATION STAFF
These splendid models, which are beautifully enamelled in colours, add the final touch of realism to Hornby Station Platforms. Price **2/-** per set.



MODELLED MINIATURES No. 13 HALL'S DISTEMPER ADVERTISEMENT
This miniature of a well-known line-side advertisement is intended to be placed in the fields adjoining the railway track. Price **1/-**



MODELLED MINIATURES No. 21. TRAIN SET
This new miniature train set is a very attractive model. It includes die-cast Locomotive, Wagon, Crane Truck, Lumber Wagon and "Shell" Petrol Tank Wagon. Price **3/-**

TRAIN NAME BOARDS
These name boards are for No. 2 Pullman Coaches and add greatly to the realistic appearance of the coaches. Details are as follows:—

No. 1 The Flying Scotsman.
No. 2 The Scarborough Flier.
No. 3 The Royal Scot.
No. 4 The Merseyside Express.
No. 5 The Golden Arrow.
No. 6 The Bournemouth Belle.
No. 7 Cornish Riviera Express.
No. 8 Torbay Limited Express.
No. 9 King's Cross, York and Edinburgh.
No. 10 King's Cross, Edinburgh and Aberdeen.
No. 11 London (Euston) and Liverpool (Lime Street).
No. 12 London (Euston) and Glasgow (Central).
No. 13 Victoria and Dover.
No. 14 Waterloo, Salisbury and Exeter.
No. 15 Paddington, Exeter and Plymouth.
No. 16 Paddington and Bristol.

Price per packet of four of a kind, **4d.**

CLIPS FOR TRAIN NAME BOARDS
These clips are for use with coaches that are not fitted with brackets to take the Name Boards. There are two types: No. 2S, for No. 2 Special Pullman and No. 2 Special Pullman Composite Coaches; and No. 2, for No. 2 Pullman and No. 2 Saloon Coaches. Price per packet of twelve, **1/-** (either kind).



OILCAN No. 1
This new oilcan is of improved design. It replaces the No. 1 Oilcan previously listed.
Price **6d.**



LAMP STANDARD No. 2
(Double)
Price **4/6**



TUNNEL No. 5 (LEFT-HAND, CURVED)
(as illustrated)
This tunnel is in the form of a small hill, through which the track runs obliquely. For 2 ft. radius tracks. Base measurement: 15⅞ in. × 14¾ in. Length of track 17½ in.
Price **7/6**

TUNNEL No. 6 (RIGHT-HAND, CURVED)
Similar to No. 5 Tunnel, but with track in the reverse position. For 2 ft. radius tracks only. Base measurement 15⅞ in. × 14¾ in. Length of track 17½ in. Price **7/6**

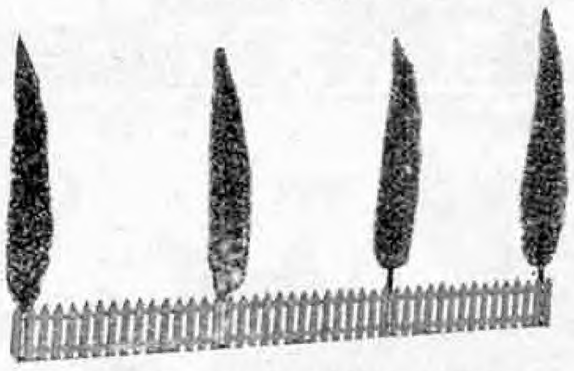


Cutting No. 4

CUTTING No. 4 (STRAIGHT)
This is a double cutting, mounted on a base over which the railway track is laid.
Base measurement: Length 15⅝ in., width 15 in. Price **6/-**



MODELLED MINIATURES No. 4 ENGINEERING STAFF
This set comprises six figures representing Electrician, two Fitters, Storekeeper, Greaser and Engine Room Attendant.
Price **2/-** per set.



FENCING WITH FOUR TREES
This is the well-known Paled Fencing, provided with four detachable miniature trees fixed in special sockets.
Price, per pair **3/6**



Two No. 1 and one No. 2 Cuttings are illustrated here.

STATION HOARDING
This is a realistic accessory, suitable for the station platform. Price **8d.**



Station Hoarding

POSTER BOARDS to carry Hornby Miniature Posters. Provided with lugs for attachment to paled fencing, etc. Packet of 6 (3 large, 3 small), Price **6d.**

POSTERS IN MINIATURE are reproductions of familiar national advertisements. They are intended to be pasted on the Station Hoardings or the Poster Boards described above, and are beautifully printed in full colours. Packet of 51 ... Price **6d.**

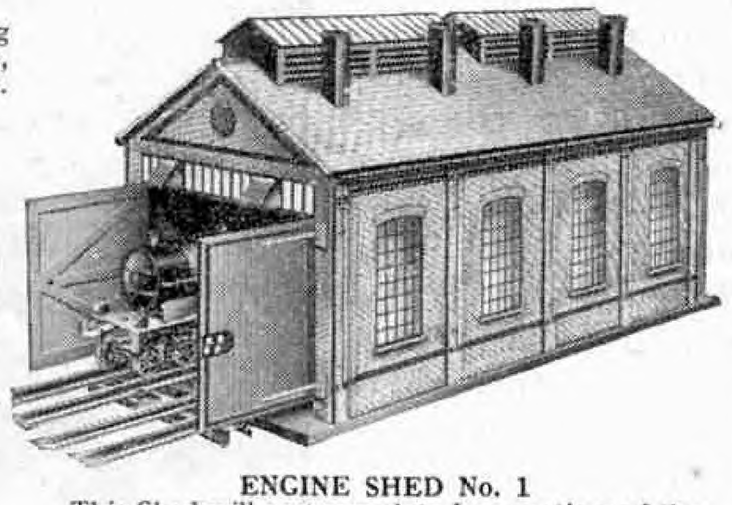
CUTTING No. 1 (END SECTION)
(Illustrated)
Base measurement: Length 7 11/16 in., width 6 in. Price, per pair **3/-**

CUTTING No. 2 (CENTRE SECTION, STRAIGHT)
(Illustrated)
The addition of these centre sections enables a Hornby Railway cutting to be extended to any length. They are intended to be used in conjunction with the End Sections (Cutting No. 1), between which they are fitted.
Base measurement: Length 10¼ in., width 6 in.
Price **2/-**

CUTTING No. 3 (CENTRE SECTION, CURVED)
This is used for curved tracks in the same manner as the straight centre section, described above, is used for straight tracks. It is suitable for both 1 ft. and 2 ft. radius tracks. Price **2/-**



MODELLED MINIATURES No. 5 TRAIN AND HOTEL STAFF
Five figures are included in this set, including Pullman Car Conductor, two Pullman Car Waiters and two Hotel Porters.
Price **2/-** per set.



ENGINE SHED No. 1
This Shed will accommodate Locomotives of the M Series, No. 0 and No. 1 types. Price **15/-**

ENGINE SHED No. 2
(as illustrated)
This Shed will accommodate any of the Hornby Locomotives and Tenders. Price **22/6**

HORNBY ACCESSORIES FITTED FOR ELECTRIC LIGHTING. The following Hornby Accessories will in future be available suitably wired and fitted for electric lighting. These items are additional to the ordinary range.

Engine Shed No. E1E, Electrical ...	Price	**18/6**	
Engine Shed No. E2E, Electrical ...	,,	**26/-**	
Station No. 2E	,,	**12/6**	
Island Platform E	,,	**9/-**	
Goods Platform E	,,	**15/-**	
Signal Cabin No. 2E	,,	**5/6**	
Signal No. 2E	,,	**4/6**	
Double Arm Signal No. 2E	,,	**6/6**	
Junction Signal E	Price	**10/-**	
Signal Gantry E	,,	**18/-**	
Level Crossing No. E1E, Electrical ...	,,	**7/-**	
Level Crossing No. E2E, Electrical ...	,,	**11/-**	
Buffer Stops No. 1E	,,	**2/-**	
Buffer Stops No. 2E	,,	**7/-**	
Water Tank E	,,	**10/-**	

In order to facilitate the electrical connection of the above range of accessories, we have introduced a series of flexible leads, fitted with plugs at one end and sockets that fit the accessories at the other. These leads are available in 3 lengths:—9 in., 18 in., and 36 in.—prices—**1/4, 1/5, 1/6** respectively.

We have also introduced a special Distribution Box to enable two or more accessories to be lighted simultaneously. This appliance is fitted with a pair of plugs, for connection to the transformer or accumulator, and also with five pairs of sockets to accommodate the flexible leads described above. Price of Distribution Box **2/6**.

Brake Vans in the Hornby Series

By "Tommy Dodd"

CONTINUING my survey of the rolling stock of the Hornby Series, I propose to devote my page this month to the Brake Vans, as these follow naturally upon the Vans considered in last month's "*M.M.*"

In actual practice brake vans serve a very useful purpose, as their name implies; and their use is compulsory except in certain special circumstances, such as on dock premises, wharves, and yards, where trains travel slowly, and as a rule are not made up to the large number of wagons customary on a main line goods train. With the loose-coupled stock in general use in England for ordinary goods work, the brake van is a very necessary vehicle for the purpose of supplementing the braking power of the engine. The assistance given in this manner is of great value, especially on steeply-graded lines with sharp undulations. In particularly severe districts two or more brake vans may be used on one train to furnish more braking power, and to avoid excessive "bunching" of the wagons in descending inclines, and jerking when steam is put on hard to climb the following rise.



The chief features of the Brake Vans of the Hornby Series are illustrated in this photograph. The vans are standing on the siding road reserved for their storage, as is the case in most marshalling yards.

No goods or mineral train on a miniature line could therefore be considered complete without its brake van, and a suitable pattern for each group is included in the Hornby Series. Two types are available, which we may distinguish as "single-ended" and "double-ended." The reason for this distinction will be apparent from the accompanying photograph. This illustrates a very familiar sight in a large goods or marshalling yard—the road set aside for the storage of brake vans during the breaking-up and making-up operations. Following the principles of standardisation that are observed in the Hornby Series, the construction of the Brake Vans is generally similar to that of the ordinary Vans. They are mounted on the latest pattern base, and are now provided with automatic couplings.

Of the examples shown in the photograph, we will consider the L.M.S.R. vehicle first. This represents a type of goods brake van that is to be seen on many sections of that line, and is in its general plan like those of the former L.N.W.R. Windows are provided at each end of the van so that the guard has a view of his train in either direction. The openings are actually pierced, so that their effect is quite realistic. The corner pillars and planking of the body sides are neatly embossed as in the case of the ordinary Hornby Vans, and an attractive feature is the provision of doors that open in the proper manner. These are fitted at one end of each side only, under a wide opening in the sides, so that the doors themselves are only about half as high as the sides of the van. The details on the doors are well reproduced and locking handles of the usual pattern enable them to be secured. A partition is fitted that divides the "room" portion of the van from the "entrance." This is in accordance with actual practice, and allows the guard to make himself as snug as possible during long night runs. In the model it gives more finish to the general construction, and provides a useful strut between the sides at what would otherwise be a weak point. The roof is of standard form, and is complete with the small chimney that is part of the equipment on every goods brake. This chimney in actual practice serves the stove provided to relieve the discomforts of the arduous duties of the goods guard. This "single-ended" Brake Van is enamelled grey, and is to be obtained with either L.M.S.R. or G.W.R. lettering, as it may represent equally well the brake vans of both companies.

The other pattern of Brake Van that is illustrated by the L.N.E.R. examples is perhaps a more symmetrical vehicle, being "double-ended" as it were, and so better balanced in appearance. The small end windows of the L.M.S.R. van are replaced by wide openings extending right across the Van from pillar to pillar. This, together with the side openings, provides splendid observation facilities, and doors are conveniently placed at both ends so that the Van consists of a central "room" portion with an entrance at each end, the centre part as before being partitioned off from the entrance. This Van is typical of many seen on the L.N.E.R. system, and may be considered to follow G.N. section practice more especially. Brake vans of the North Eastern section are similar in style, but differ in having central side look-outs as fitted to many passenger brake vans, while plain openings in the sides replace the doors, so that there is a verandah, as it were, at each end.

The S.R. also use the "double-ended" type of brake van fairly extensively, so that the Hornby example is available with either L.N.E.R. or S.R. lettering, the body colour in each case being brown. The roof, complete with chimney, is finished in white, as is that of the "single-ended" van. Whatever group is favoured, a suitable Hornby Brake Van therefore is available.

H.R.C. COMPETITION PAGE

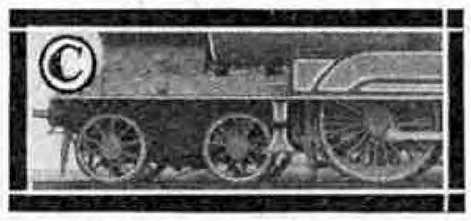
Competitions appearing on this page are open only to members of the Hornby Railway Company. Envelopes containing entries should have the title of the competition clearly written in the top left-hand corner and should be addressed to the Hornby Railway Company, Binns Road, Old Swan, Liverpool. The name, address and membership number of each competitor should appear in clear writing on every sheet of paper used.

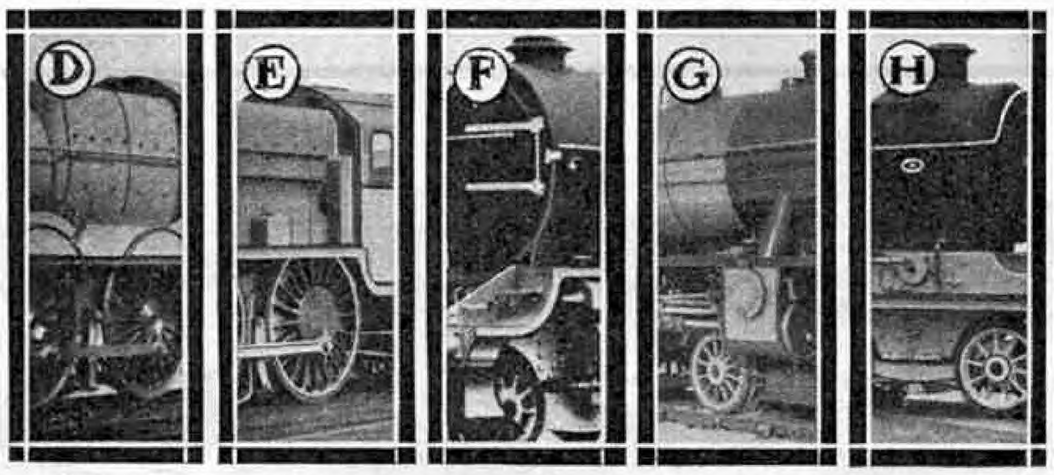
LOCOMOTIVE FEATURE CONTEST

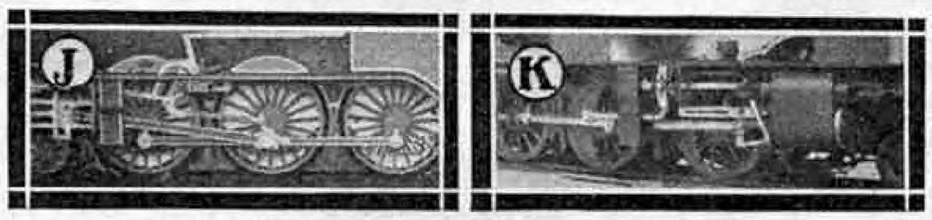
The four British railway groups possess many different classes of both passenger and goods engines. Most of these classes have some characteristic feature in design by which they may be distinguished from any other class. For instance, no railway enthusiast could mistake an L.N.E.R. "Pacific," a G.W.R. "King" or an S.R. "Nelson" for an engine of any other class. There are numbers of locomotives that are not quite so easy to identify, however, on account of the fact that they are variations of other classes, from which they differ only in minor details. Thus the "Precursor" engines of the L.M.S.R. Western Division that have been superheated are very similar in appearance to the "George the Fifth" locomotives on the same line. Except for a difference in the driving wheel splashers the two classes are so alike as to be easily confused. From the identification point of view these locomotives are by far the most interesting, because of the problems they present. The most popular competitions that have appeared on this page have been those in which H.R.C. members were invited to put their railway knowledge to practical test, and this month we provide an opportunity of this kind in regard to locomotives.













The illustration on this page shows portions of different classes of well-known locomotives, and each of the pictures includes some prominent feature peculiar to the particular class concerned. Competitors are required to state to which class each of the locomotives belongs, the group owning it, and the characteristic feature in the picture by which the locomotive was identified. This last-mentioned feature need not be given a long description; it will be sufficient to state in a few words exactly what it is.

To the competitor in each of the two sections, Home and Overseas, who sends in the most accurate solution, a prize of Hornby Train material (or Meccano products if preferred) to the value of 21/– will be awarded. To the senders of the three entries judged next in order of merit will be awarded similar goods to the value of 15/–, 10/6 and 5/– respectively. There will also be a number of consolation prizes. In the case of a tie, neatness and novelty of presentation will be the deciding factors.

Envelopes containing entries should be marked H.R.C. "*Loco Feature Contest*" in the top left-hand corner and posted to reach Headquarters at Meccano Ltd., Binns Road, Old Swan, Liverpool, on or before 30th June. The Overseas Section closes on 30th September.

Entries received after the published closing dates will not be entertained and any not bearing the competitor's H.R.C. number will not be accepted.

Summer Photographic Contest

This is the time of the year when interest in railway photography reaches its highest level. Light conditions are favourable, and most members of the H.R.C. take full advantage of the long days of summer, and of the opportunities afforded by holidays, to visit places of railway interest. This plan gives them splendid openings for taking photographs of giant locomotives hauling famous trains, or of other attractive scenes that possess the great merits of railway interest and novelty.

In order to encourage members to make the best use of their cameras on excursions of this kind, this month we are offering prizes in a competition in which even beginners in photography may join. The subject of the contest is "*The Most Interesting Railway Photograph.*" Those who enter this competition are asked to forward prints of railway scenes and they may submit as many entries as they wish. No competitor will be awarded more than one prize, however, and while the photographic merits of the prints submitted will be taken into account, their interest from a railway point of view also will be carefully considered by the judges and will be the deciding factor in the event of a tie for any prize.

Prizes consisting of Hornby Railway material (or Meccano products if preferred) to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the senders of the four most interesting photographs, and a number of consolation prizes also will be awarded. The competitor's name and full address must be written on the back of each print submitted, together with his H.R.C. membership number, omission of which will result in disqualification, and a description in a few words of the scene of the photograph and of the railway features shown.

Envelopes containing entries should be clearly marked H.R.C. "*Summer Photo Contest No. 1*" in the top left-hand corner, and should be posted to reach Headquarters at Meccano Ltd., Binns Road, Old Swan, Liverpool, not later than 30th June. The closing date for the Overseas competitors is 30th September.

COMPETITION RESULTS

HOME

March "Missing Links Contest."—First: R. Couling (28701), Southall, Middx. Second: R. E. Giles (21323), Newport, Mon. Third: H. W. Kyte (15679), East Molesey, Surrey. Fourth: J. T. Trotter (11447), West Dulwich, London, S.E.21.

March "Station Layout Contest."—First: D. F. Cleminson (8922), Chiswick, London, W.4. Second: R. A. S. Musker (13162), Hightown, Nr. Liverpool. Third: F. R. Dubery (3309), Beckenham, Kent. Fourth: D. G. Tucker (16329), Chingford, London, E.4.

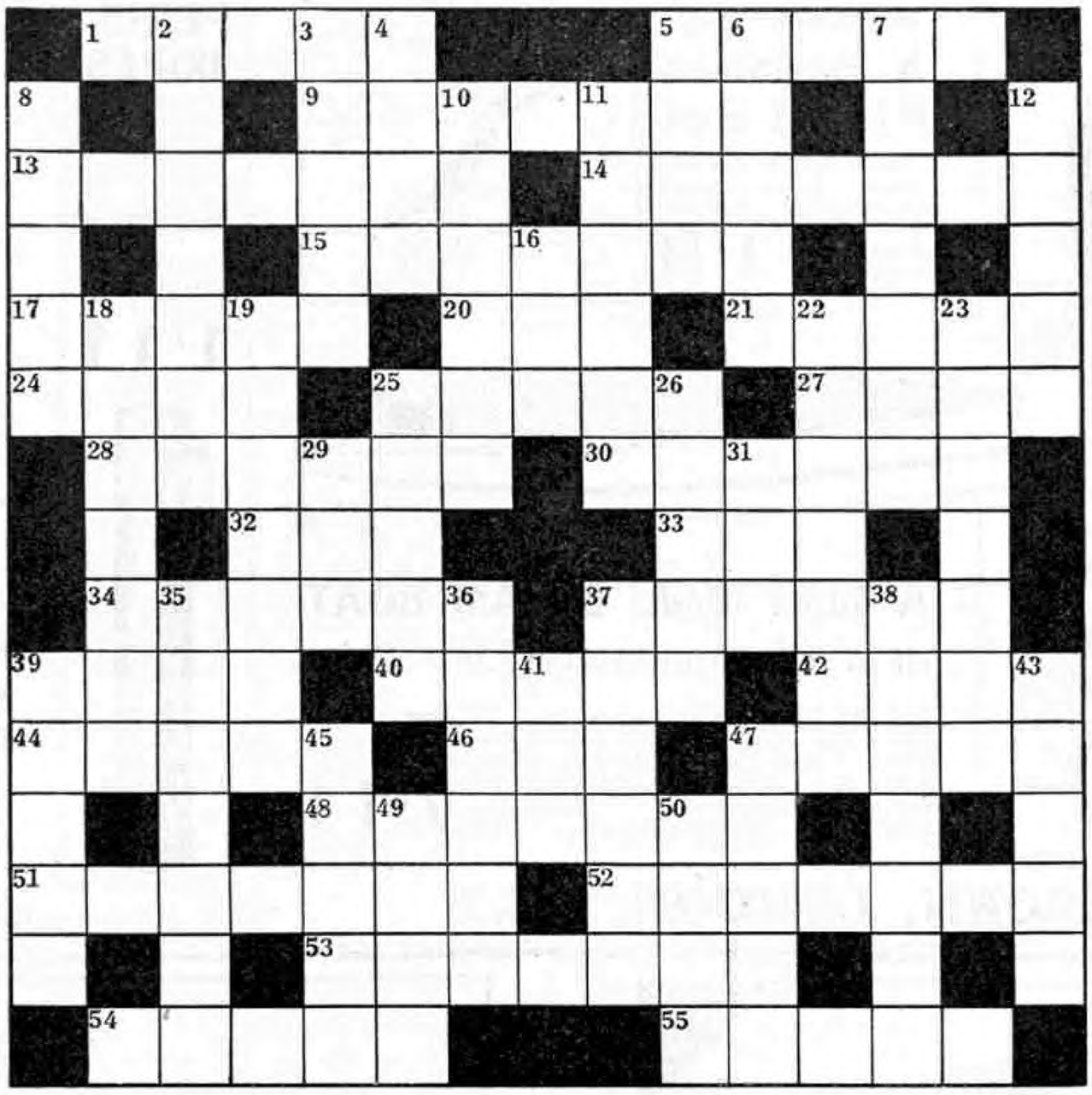
March "Painting Contest."—First: P. A. Vicary (25935), Cromer, Norfolk. Second: C. A. Brunt (10229), Leeds. Third: D. W. England (29151), Woodside, Aberdeen. Fourth: R. G. Russell (26591), Newlands, Glasgow, S.3.

OVERSEAS

December "Christmas Loco Contest."—First: F. L. Bingen (28995), Holland. Second: N. Glenday (22983), S. Canterbury, New Zealand. Third: J. H. Neville (23636), Darlington, W. Australia. Fourth: J. W. Boyes (9959), Wellington, New Zealand. Consolation Prizes: F. W. Whyte (17289), Queensland, Australia; R. B. McMillan (9592), Melbourne, S.C.2, Australia; M. L. Morgan (22858), N.S.W., Australia; F. van Bulck (1875), Forest-Brussels, Belgium; W. Moore (20918), Toronto, Canada; G. E. Schulz (15425), Coromby, Australia; R. F. Dennison (14387), Otago, New Zealand; A. Venus (25494), Montreal, Canada; W. J. T. Watson (18065), Leichhardt, N.S.W., Australia; W. Jack (8958), Leichhardt, N.S.W., Australia; I. T. G. Johnstone (8817), Wellington, New Zealand; J. Hers (8270), Potchefstroom, S. Africa; H. W. J. Speckham (16032), Natal, S. Africa.

Competition Page

JUNE CROSSWORD PUZZLE



CLUES DOWN

2. One of three
3. Share
4. Sly Look
5. Claw
6. Occupation
7. Waste
8. Portion
10. Increasing
11. Domestic Animals
12. Growl
16. Finish
18. One who lays closely
19. Messages
22. Studio
23. Very simple
25. Passage
26. Precious things
29. Rage
31. Route
35. Not true
36. Greeting
37. Gold nugget
38. Severe critics
39. Sudden rush
41. Hill
43. Experiment
45. Strips of Iron
47. Newly-wed
49. Singly
50. Goes astray

CLUES ACROSS

1. Take away
5. Assistants
9. Dressed skin
13. Warbled
14. Address
15. Regulated
17. Creek
20. Opposite of outs
21. Corrodent
24. Look
25. Concluded
27. Water fowl
28. Twine
30. Cuts
32. Skill
33. Trouble
34. Ships
37. Commend
39. Despatch
40. Gates (Old Engl.)
42. Otherwise
44. Push
46. Shorten
47. Aprons
48. Runner
51. Test
52. Beetles
53. Sheltered
54. Rests
55 Faculty

In announcing our March Crossword Puzzle—the result of which is published on this page—we commented that although some seven or eight years had passed since these puzzles had been introduced into Britain, their popularity showed no sign of waning. That view was amply confirmed by the huge entry—in fact we can only conclude that they are more popular than ever.

The competitions in the "*M.M.*" are set for the amusement of our readers principally, and in the crossword puzzles every effort is made to avoid unfair traps in the form of alternative solutions. In the March puzzle there was one trap, but careful examination of the clue revealed which of the two alternatives was intended.

This month's puzzle is, we think, rather harder, but there is no intentional trap and the clues will be found perfectly straightforward. Every word used will be found in Chambers or any other good dictionary. Beyond this it is unnecessary to make any explanation of the requirements of the competition, for the rules governing the solution of crossword puzzles are well known.

Prizes of Meccano or Hornby Train goods (to be chosen by the winners) to the value of 21/–, 15/–, 10/6 and 5/– respectively, will be awarded to the senders of the first four correct solutions, in the order in which they are opened on the morning following the closing date. In addition there will be a number of consolation prizes, and, in awarding these, neatness and style of presentation will be taken into consideration. These prizes will be duplicated for Overseas competitors.

Entries should be addressed " June Crossword Puzzle, Meccano Magazine, Binns Road, Old Swan, Liverpool," and must be sent to reach this office not later than 30th June. Overseas closing date, 30th September.

Competitors who wish to preserve their "*M.M.'s*" intact need not cut out the crossword illustration. It will be in order to make a copy of the square and fill that in.

June Photographic Contest

As we announced in our April issue, our monthly photographic contests are open for photographs of any subject. The only restrictions are that each print must bear a title and that the exposure shall have been made by the competitor.

The entries will be divided into two sections, A for those from readers aged 16 and over, B for those under 16, and in each section there will be prizes of photographic materials, or Meccano products, to the value of 21/– and 10/6 for the best and second best entry respectively.

Entries to this month's contest must be addressed " June Photo Contest, Meccano Magazine, Old Swan, Liverpool," and must reach this office not later than 30th June. Overseas, 30th September.

COMPETITION RESULTS

HOME

Happy Snaps (Children's Section). First Prizes: Section A, A. Martin (Birmingham); Section B, B. W. Aldwell (Belfast). Second Prizes: Section A, S. James (Welwyn Garden City); Section B, P. Challis (Bexhill-on-Sea). Consolation rizes: H. R. Deacon (Cheltenham); A. G. Dodsworth (Pendleton); A. Flurrie (Mistley); M. E. Noyes (Bishop's Stortford); S. Vertue (Sanderstead). **(Animals' Section).** First Prizes: Section A, H. E. Tomlinson (Blackpool); Section B, M. E. Noyes (Bishop's Stortford). Second Prizes: Section A, R. B. Grice (Swanage); Section B, F. Simpkins (Paddington, W.2). Consolation Prizes: A. K. Corser (Birmingham); Miss Pennethorne (Haywards Heath).

March Crossword Puzzle. 1. F. W. Jones (Chingford, E.4); 2. D. G. Couper (Edgware); 3. D. G. Girling (Stowmarket); 4. P. Bryant (Portsmouth). Consolation Prizes: J. V. Campbell (Dumbarton); H. L. Collings (London, W.3); E. W. Gibbins (Leicester); F. Heslop (Doncaster); R. G. Jenkins (Bristol); K. Murby (Cheltenham); T. W. Steer (Wallasey); F. S. J. Vigot (Jersey); J. A. Wainwright (S. Tottenham, N.15); D. H. Wallis (Wimbledon, S.W.19).

OVERSEAS

Crane Drawing Contest.—First Prizes: Section A, R. T. J. Blick (Canterbury); Section B, M. Lester (Taranaki, N.Z.). Second Prizes: Section A, S. D. Kurlawala (Bombay); Section B, R. Lister (Red Deer, Alta.). Consolation Prize: G. N. Rattee (Martintown, Ont.).

Missing Words.—The missing words should be replaced in the paragraph in the following order:—Remarkable, wonderful, rate, created, competitors, rivals, attained, airman, established, pilot, surpassed, beaten, mistake, made, reached, speed, error, thought, believed, considered, amazing.

The prizes were awarded as follows:—1. R. Crawford (Ottawa); 2. J. G. Mendonça (Georgetown); 3. M. Maddock (Newfoundland); 4. N. E. Hodson (Wellington, N.Z.). Consolation Prizes: M. M. Bruce (Tasmania); Cheong Ann Koh (Singapore); R. Inch (Montreal); V. Leembruggen (Colombo).

Christmas Decorations. First Prizes: Section A, F. Thomas (Toronto); Section B, R. J. Evans (Vancouver). Second Prizes: Section A, B. D. H. J. Silva (Colombo); Section B, J. M. Rodriguez (Montreal).

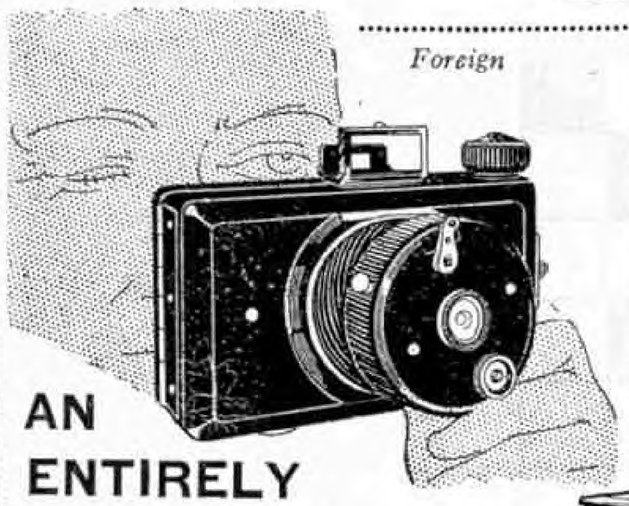
Christmas Essay. First Prizes: Section A, T. Elliott (Sydney, N.S.W.); Section B, J. A. Rodriguez (Montreal). Second Prizes: Section A, R. Garcia (Trinidad); Section B, D. Read (Toronto).

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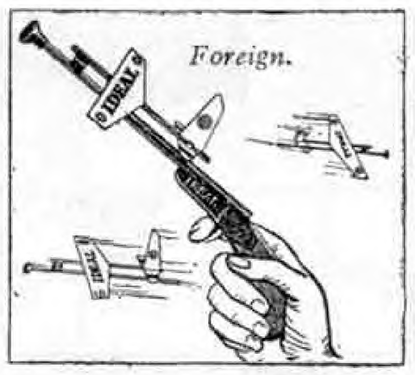
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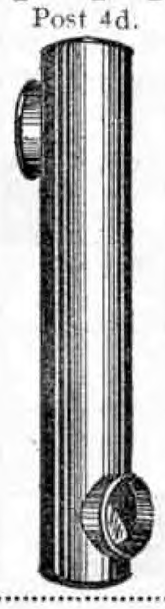


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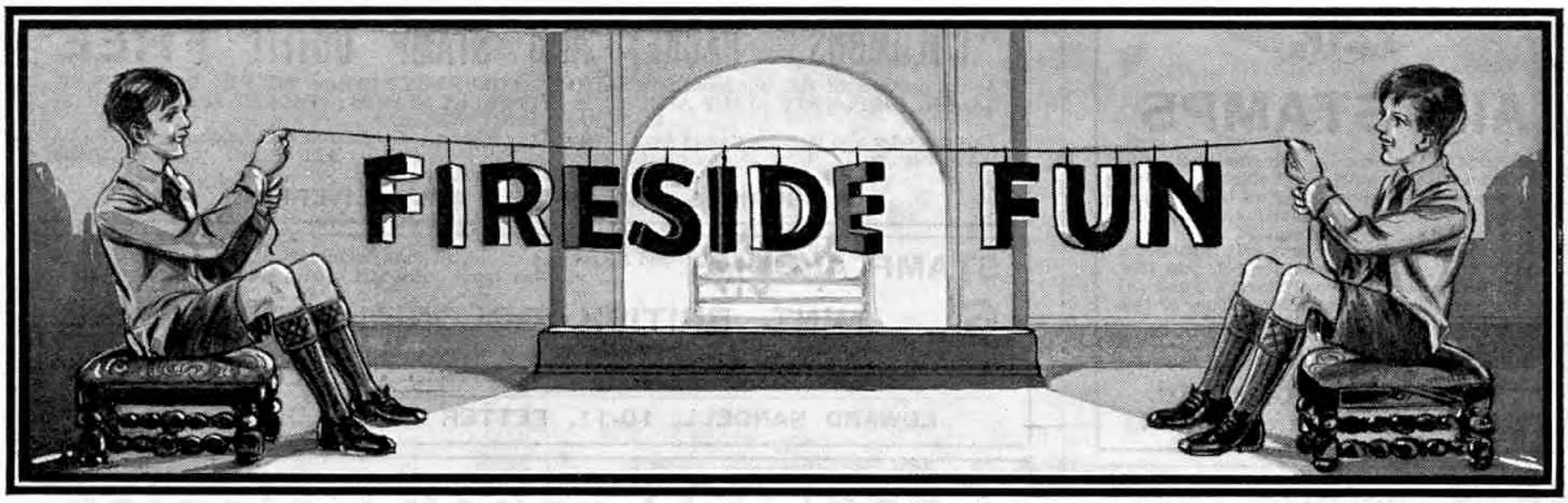
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MAKING THINGS SAFE

Mother: "Jimmy, what are you doing there in the pantry?"

Jimmy (hopefully): "Just putting a few things away, Mother."

* * * *

"I think I shall rather like the new cook we got this morning. There seems to be plenty of go about her."

"There is: she's gone!"

* * * *

"Now, Tommy, tell me what are the silent watches of the night?"

"Er, the ones whose owners have forgotten to wind them."

* * * *

Foreman: "None of you men may leave until you've been searched."

Men: "Why?"

Foreman: "Because a barrow's missing."

* * * *

"Have you ever been offered work?"

"Only once, Ma'am," replied the tramp. "Apart from that, I've met with nothing but kindness."

* * * *

"Why do you whitewash the chicken coop?" asked the tiresome young man from the city.

"So that the hens won't pick the grain out of the wood, of course," snapped Farmer Giles.

* * * *

Keen Gardener: "Did you write to the nurseryman about the herbaceous border?"

Wife: "No, I telephoned instead. I would rather say 'herbaceous' than spell it."

* * * *

"That man lost two years of his life through modern science."

"Good heavens, did somebody make a mistake during an operation?"

"No. Finger-prints found on a safe corresponded with his."

* * * *

"Does your brother lie awake at night, Jimmy?" asked a friend.

"Yes," replied Jimmy, "and he lies in his sleep, too, particularly when he dreams that he's fishing."

* * * *

JUST LIKE FATHER'S!



Barber: "Well, my little man, and how would you like your hair cut?"

Small Boy: "If you please, sir, cut it like father's; and don't forget the little round hole at the top where the head comes through."

* * * *

Mistress (to new girl): "You must take great care of the pictures. That small one of a beggar cost the master £2,000."

New Maid: "Lor', ma'am, my mother got a picture of the whole Royal family for sixpence."

FULL OF GO!

"What I want is a smart boy, who is alert and intelligent. Are you quick to take notice?"

"Yessir—'ad it three times in a fortnight once!"

* * * *

"That man thinks he knows everything, but there's something he doesn't know."

"What is it?"

"How much he doesn't know!"

* * * *

"If a man smashed a clock, could he be accused of killing time?"

"Not if he could prove that the clock struck first."

* * * *

A LOW DOWN GAME



Tramp: "Hey, this dog of yours is biting my ankle!"

Farmer: "Of course he is. You surely don't expect such a short-legged dog to bite your neck!"

* * * *

Hostess: "Won't you have some of this cake?"

Guest: "No, thank you. I'm dying to try it, but I'm also trying to diet."

* * * *

Magistrate: "Do you plead guilty or not guilty?"

Prisoner: "Not guilty, sir."

Magistrate: "Ever been arrested before?"

Prisoner: "No, sir, I never stole anything before."

* * * *

"What are you crying for, Billy?"

"Father's invented a new soap, and every time a customer comes in I get washed to show how good it is."

* * * *

Teacher: "Jimmy, give me a sentence with the word intense."

Jimmy: "This summer I went to camp with the scouts and we slept intense."

* * * *

"You're afraid to fight, that's what it is!"

"I ain't, but my mother will hammer me if I fight you."

"How will she find out? Tell me that?"

"She'll see the doctor comin' to your house."

* * * *

Mother: "Sonny, be a good boy and sit down and tell baby a story."

Sonny: "I'm sorry, mother, but I told Dad a story just now and I can't sit down."

* * * *

"Two pounds of sugar, please."

"Here you are, that will be fivepence."

"Well I'll bring the sixpence to-morrow, and take a penny change now as mother wants it for the gas meter."

* * * *

"Did you give your husband the mustard plaster I ordered?"

"Yes, doctor, but can he have a bit of bread or something with it next time? He says it was terribly hot eating it alone!"

* * * *

Man (to Doctor): "What can I do to this boil at the back of my neck?"

Doctor: "Nothing much, but keep your eye on it."

TARIFF OPERATIONS

"Isn't there a lot in the papers now about people having this local anæsthetic?"

"Yes; I suppose there must be too much duty on the imported stuff!"

* * * *

Manager (glancing at time sheet): "Jones absent again to-day, I see. I suppose he has some sort of lame excuse."

Clerk: "He has, sir. He's broken his leg."

* * * *

Teacher (during English lesson): "In this stanza what is meant by the line 'The shades of night were falling fast'?"

Clever Boy: "The people were pulling down the blinds, sir."

* * * *

The school inspector was testing the class on American history.

"Why," he asked, "should the Americans celebrate George Washington's birthday rather than, say, mine?"

"Because Washington never told a lie, sir," came the reply.

* * * *

Prospective Employer (discussing applicant for work over telephone): "Tell me, is the boy steady?"

Late Employer: "Rather! If he were any steadier he'd be motionless."

* * * *

Housewife (to tramp): "You're a big strong man. Why don't you get some work to do instead of going round begging like that? You know hard work never killed anyone."

Tramp: "You're wrong there, mum. I've lost two wives that way already."

* * * *

"What be that stickin' plaster on thy vace ver, Jarge?"

"Tis 'cos of a game 'twere played after Harvest Supper last night. Varmer Brown offered a prize for who could pull the ugliest face, and they all come and pulled mine."

* * * *

The old salt was spinning the usual yarns to the visitor to the little fishing village.

"Yes, sir," he said, "I was once shipwrecked and lived for a week on a tin of salmon."

The listener was not impressed.

"By jove!" he said. "You couldn't have had much room to move about, what!"

* * * *

CHEAP RESCUES



Rescued man: "You have saved my life, and I would gladly give you a shilling, but I regret to say that I have only a two-shilling piece."

Rescuer: "Never mind, jump in again, and give me a chance to earn the other shilling."

* * * *

The two tramps had just left the small town behind them.

"What happened when you asked the cook at the doctor's house for some pie?" demanded one.

"I received a tart reply," said the other.

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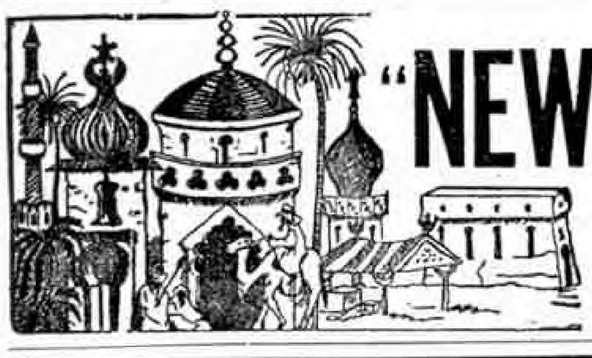
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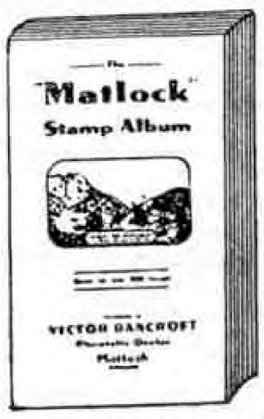
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For further stamp advertisements see page 480



Stamp Gossip

and Notes on New Issues



Italian Literary Charity Stamp

Italy is one of the very few countries that have been able to maintain an undiminished popularity for a continuous run of commemorative and charity stamp issues. Success in circumstances such as these can be commanded only when a high standard of interest is allied to an equally high standard of production. In this respect Italy is fortunate, for she has an artistic history that presents an almost endless fund of suggestion for the stamp designer.



The newest series is a long one, containing no less than 13 postage and six air post stamps. It has been issued to aid the funds of the Societa Nazionale Dante Aligheiri, which has for its principal aim the spread of Italian culture throughout the world. The higher values are issued at a premium, the whole proceeds of which go to the Society.

There is not space here to deal in detail with the subjects of the designs, which are as follows:—10c., Giovanni Boccaccio (1313-1375); 15c., Nicolo Machiavelli (1469-1539); 20c., Fra Paolo Sanpi (1552-1625); 25c., Count Vittorio Alfieri (1749-1803); 30c., U. Foscolo (1776-1827); 50c., Count Giacoina Leopardi (1789-1837); 75c., Giosne Carducci (1835-1907); 1L.25, Carlo Guiseppe Botta (1766-1837); 1L.75, Torquato Tasso (1544-1595); 2L.75, Francesco Petrarch (1304-1374); 5L.+2L., Ludovici Ariosto (1474-1533), the author of *Orlando Furioso*, the epic history of the great Este family, considered by many to be among the world's greatest poems. The 10L.+2.50L. bears a portrait of Dante



himself, one of the three great poets of the early Renaissance, who lived from 1265 until 1321.

The air mail series is devoted exclusively to Leonardo da Vinci, the outstanding figure of Italian artistic history. He lived between 1452 and 1591, and was not only a great painter, but also a great architect and scientist. The earliest flying machine was the product of his brain, and our illustration shows him endeavouring to fly a manually operated machine.

We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations for our stamp pages have been made.

A Saint's Signature

The Portuguese Indian stamps commemorating the St. Francis Xavier exhibition at Goa have several points of special interest. They are, for example, the first series turned out by the Indian Nasik Press for any Government other than its own. The designs too include an unusual feature, a facsimile of the Saint's signature reproduced on the 2 reis value. The "Francisco" is perfectly legible, as our illustration shows, but the curious heiroglyphics immediately preceding and succeeding the signature are rather puzzling until it is explained they are a contraction of his mother's surname, Xavier, which he adopted as his own.

The series consists of seven values ranging from 1 reis to 2½ tangas. In addition to the autograph stamp there are four separate designs, the 1r. showing a monument of St. Francis, the 6r. and 1½t., a view symbolical of his first landing in India, the 2t. a view of the Church of Bom Jesus at Goa, the headquarters of his great missionary work and, finally, on the 2½t., a view of his mausoleum in the church at Goa.



Air Mail Prices

The trend of prices for air mail rarities is ever upward, and it is impossible for catalogues published at yearly intervals to do more than approximate the real value.

At a recent New York auction many interesting pieces changed hands, and it is interesting to compare the prices realised with the figures quoted in the Gibbons' Air Stamp catalogue published in February last. The figures given are first the auction and, in parentheses, the catalogue prices:—Columbia 1919, £115 (£150 Mint; £50 used); Dominica Cyclone, £7/3/– (£13); Ecuador 10s., £22/10/– (£20); Honduras 10c. black surcharge, £175 (unquoted in catalogue); Newfoundland, Hawker, Mint, £300 (unquoted Mint; Used £200); Newfoundland, Pinedo, Mint, £345 (unquoted Mint; Used £50); Newfoundland, Columbia, Mint, £81 (£100). The fact that the Pinedo stamp fetched more than the Hawker is, of course, a reflection of the smaller quantity of Pinedos existing in Mint condition. The quantities are: Pinedo 66, Hawker 87.

At the same auction a Hawker cover fetched £225, and a Pinedo cover £37. A sheet of 12 of the Honduras 1925 20c. with blue overprint, containing two *tête-bèche* pairs, was sold for £360.

Panama Commemorative Air Stamps

The 130th anniversary of Panama's independence was celebrated in November last by a special 5c. air stamp for use on the newly inaugurated inland air mail service between Panama City and various towns in the western parts of the state. The design, which was illustrated in our April issue, shows a monoplane flying over the ruins of Panama Viejo on the southern coast. The inscriptions read "Republica de Panama, Correo Aerea" at the top, and "Noviembre 28 de 1931—Primer Vuelo Nacional" at the bottom.

Some 40,000 copies were printed and placed on sale throughout the Republic. Those remaining unsold at the end of December were returned to the Head Post Office at Panama City.

A Latvian Legend

The National Army Reserve (Latvijas Aizsarsi) is the latest Latvian charity to benefit from a stamp issue. A special short series of five stamps bearing a premium in aid of its funds was issued in February last.

The designs of the stamps tell the story of the delivery of the Letts from slavery to liberty by the god Lacplesis, a great slayer of bears. The legend runs that in ancient days Livonia, as Latvia was then known, was a country of age-old happiness and prosperity, and possessed an extensive foreign trade. Foreign trading visitors cast envious eyes upon happy Livonia, however, and by treachery they brought soldiers to the country in the holds of their ships. After conquering the country by fire and sword, the invaders built themselves strong fortresses and held the Letts in slavery and dire distress. Not until Lacplesis came upon the scene was there any effective opposition, but ultimately the foreigners were driven out of the country. To this day, the legend runs, the spirit of



Lacplesis watches over Latvia.

The designs of the stamps are as follows:—1+10 sant, Kriva the Bard; 2+15s., the foreign invasion; 3+20s., Lacplesis the bear-slayer; 4+30s., illustrated here, the liberation of Latvia; 5+40s., the Spirit of Lacplesis.

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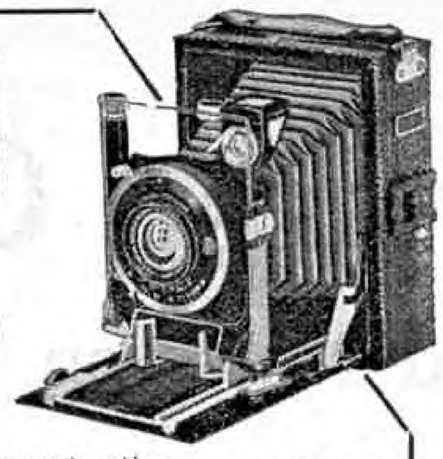
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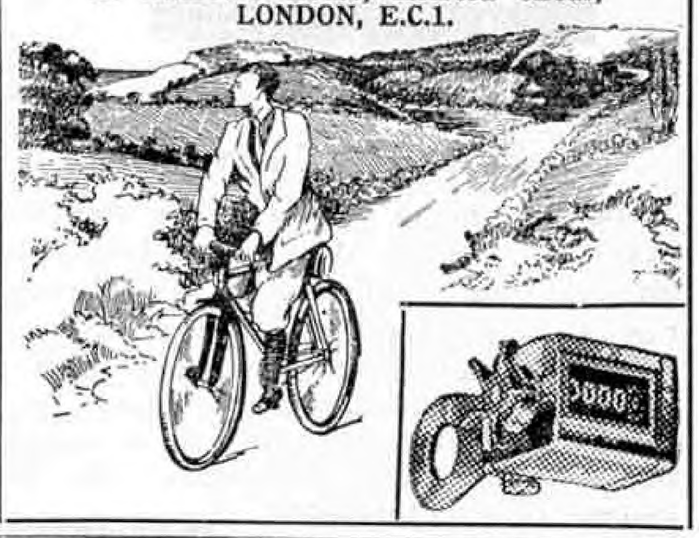
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SOME GENERAL HINTS TO BEGINNERS



Oxen yoked to an Egyptian plough.

MANY cameras make their appearance at Easter and at Whitsuntide, but it is during the month of June that the photographic "epidemic" really begins in earnest. At this time of the year we always receive large numbers of letters from readers who are in need of advice on some photographic matter, and in this article we propose to give a few hints on the points that most frequently arise.

Perhaps the commonest question of all that comes along is in regard to the expense of photography. Many people have the idea that the hobby is necessarily costly, but this is not the case. The people who make the loudest complaints about expense are invariably those who have not taken trouble to acquire the small amount of skill that is needed, and therefore have a large proportion of failures among their snapshots. Photographic films, plates and papers are now so cheap and so simple to use that a reasonably careful photographer should obtain a fairly good result from almost every snapshot.

The commonest cause of failure is that of attempting impossibilities. A box-form camera of tiny size is capable of achieving results equal to those secured with the biggest and most expensive instruments; the difference lies in the fact that the more expensive equipment can turn out good results under conditions that are impossible for the cheap camera. The expensive camera has a big lens and a many-speeded shutter, while the cheap camera probably has only one snapshot speed and a lens of small aperture.

To make our point clear it will be well to explain that the act of opening the shutter allows a certain quantity of light to pass into the camera—the larger the aperture of the lens the greater the amount of light passed. The quantity of light thus admitted decides the fate of the film. If it is either insufficient or excessive for the particular subject that is being photographed, the exposure is either partially or entirely a failure. In good light conditions the small cheap camera passes as much light as is necessary to give a perfect exposure, but it cannot possibly have the wide range of a camera with an expensive lens.

Obviously, then, if the owner of a cheap camera wishes to secure good results he must consider the limitations of his instrument and not attempt the impossible. Snapshots in the late evening or indoors, or subjects moving at high speeds near the camera, are out of the question.

The tiny size of the film employed in the cheap camera has no bearing on the results. The contact print from a good small picture has all the quality of the post-card photograph, and if desired it can easily be enlarged to this size. If, on the other hand, the tiny picture is a failure, the cost of scrapping it is infinitesimal in comparison with the cost of large-size films. It is indeed an advantage to have a small camera, for the running costs are considerably less. The position may be summed up thus—the small camera gives more snaps to the pound than its bigger brother!

If every photographer would take the small amount of trouble involved in learning the limitations of his camera, the old cry "photography is too expensive" would soon be a thing of the past.

In considering the possibilities of the small camera we have disregarded the question of whether plates or films are to be used, simply because very few amateur photographers use plates nowadays. The handiness of roll films has made them pre-eminently the material for the photographer who is out simply for enjoyment and to secure pictorial reminders of his fun.

Elsewhere in this issue will be found an interesting article on the joys of camping. The photographer in camp has a wonderful opportunity of securing a splendid collection of photographs. The most ordinary scenes of camp life make excellent pictures, and, apart from the interest they will recall in later days, there is always the opportunity of selling prints to assist in defraying the expenses of the holiday. For this kind of photography a small pocket camera is really the best, as it can always be carried ready for immediate use when a good opportunity arises.



Street scene in Zanzibar.

The most successful photographs are those taken when the subject is quite unaware of the fact that he is being immortalised! There is always a touch of life in snapshots taken unawares that is absent from a carefully posed picture, and this is particularly the case with little groups busily engaged on some task such as preparing the mid-day meal. One thing should always be borne in mind, however, and that is no one should ever be photographed in circumstances that would cause him annoyance.

There is one carefully posed photograph that should be taken, and that is a group of members of the camp. Such a photograph provides a splendid memento, and is of interest to everybody concerned. There is no particular difficulty about taking a group of this kind, except that with a very small camera care should be taken to stand far enough back to bring every member of the group well within the boundaries of the picture. The photograph should be taken in as good a light as possible, but preferably not in direct sunshine.

One piece of advice that concerns every owner of a roll film camera may be given here—wind on the film immediately after each exposure has been made. This soon becomes automatic if it is made a regular practice, and it will prevent the aggravating experience of taking two photographs on one film. If the winding-on is delayed for even a few minutes it is surprising how difficult it is to remember with certainty whether it has been done or not!

Every beginner, before he has possessed a camera for long, tries his hand at photographing some of the delightful streams and waterfalls to be found in woods. The results are almost always complete failures, or at least very disappointing. The reason for this is that the beginner attempts snapshots which, as a rule, are out of the question. He fails to realise to what a great extent the trees cut off the light. In such circumstances the eye is a poor guide to the strength of the light, on account of the ready way in which it adapts itself to differing conditions. In practically all woodland scenes a time exposure is necessary, and this can usually be given by resting the camera firmly on a rock or other convenient support.

Next month we shall deal with this exposure problem, and with the use of the camera generally.



Another Egyptian ploughing scene.



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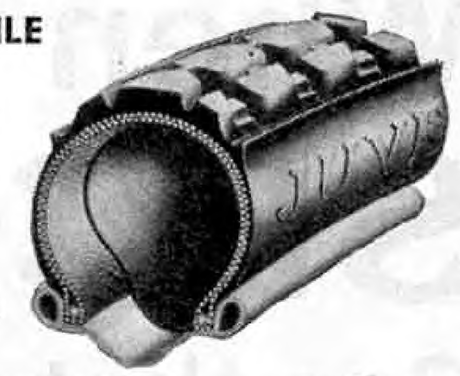
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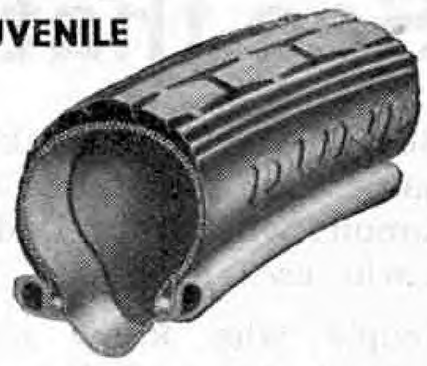
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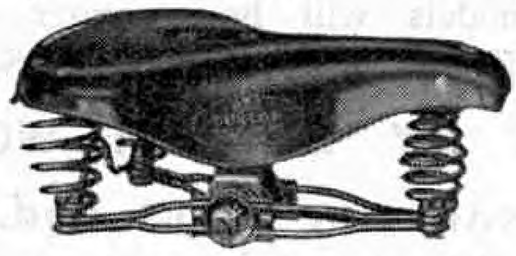
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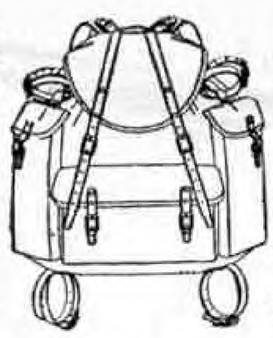
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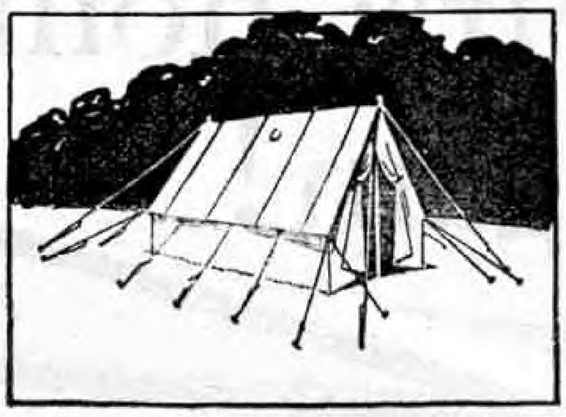
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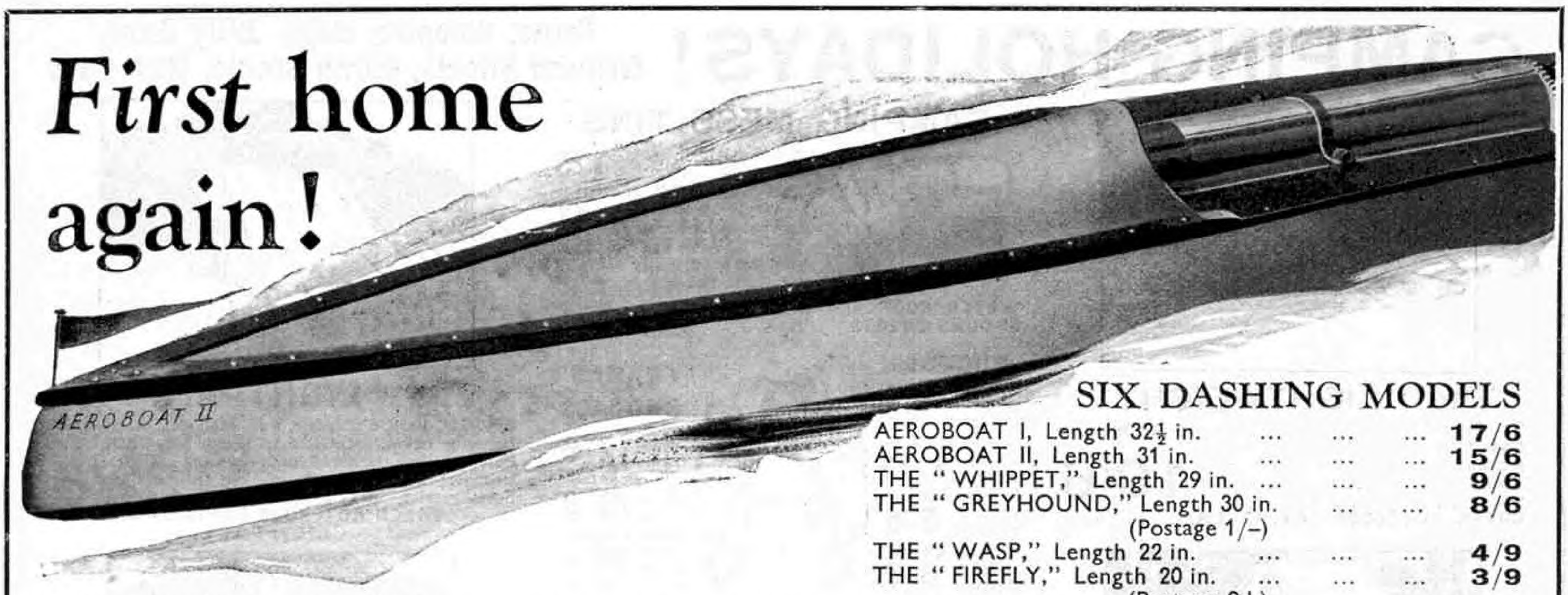
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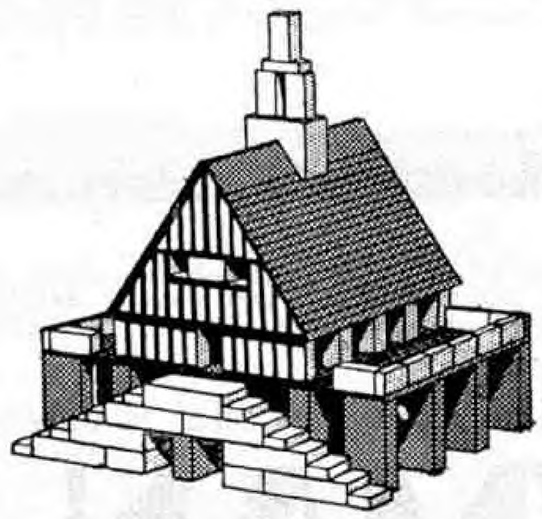
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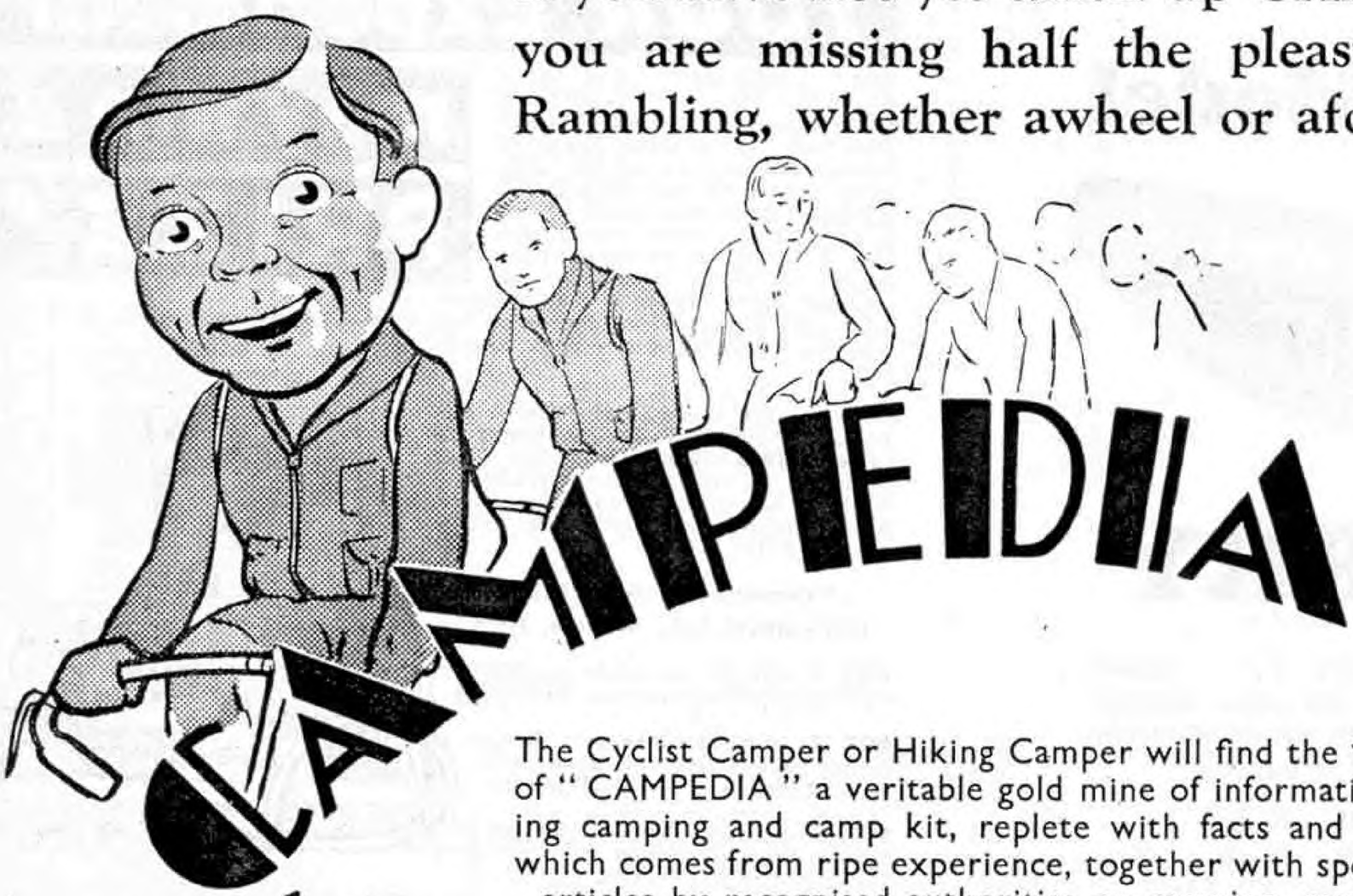
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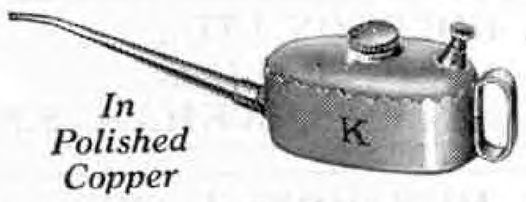
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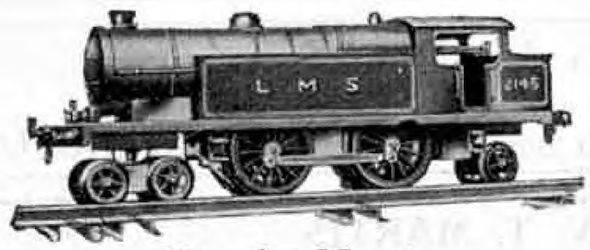
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H.R.C.
WRITING PADS

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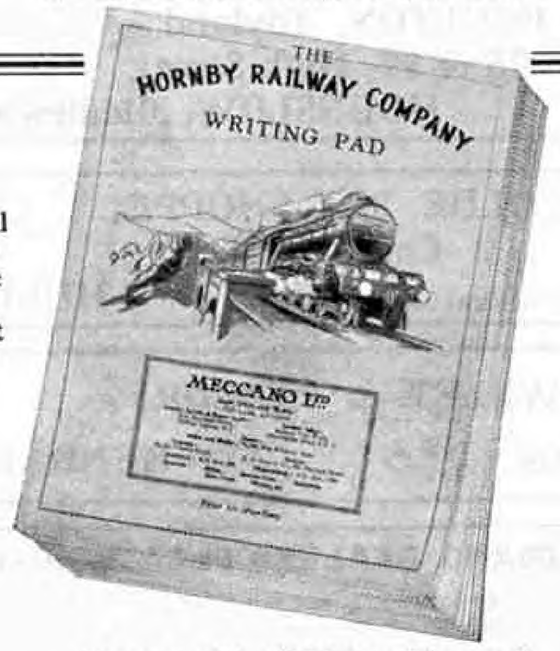
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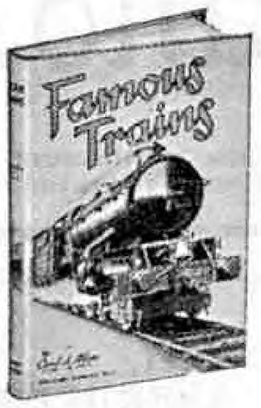
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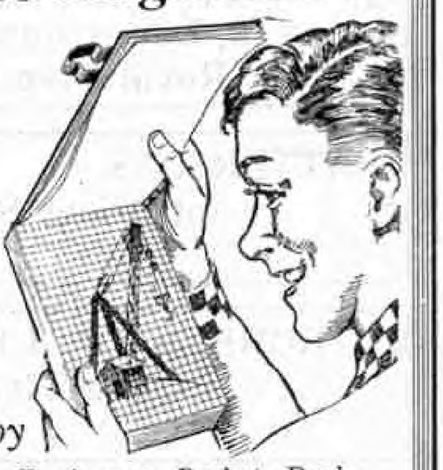
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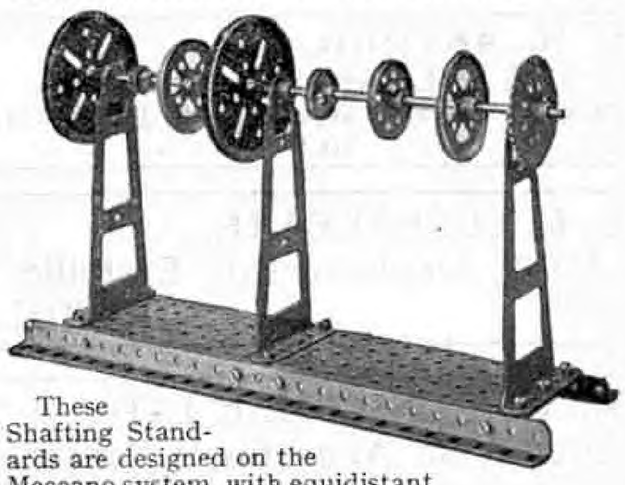
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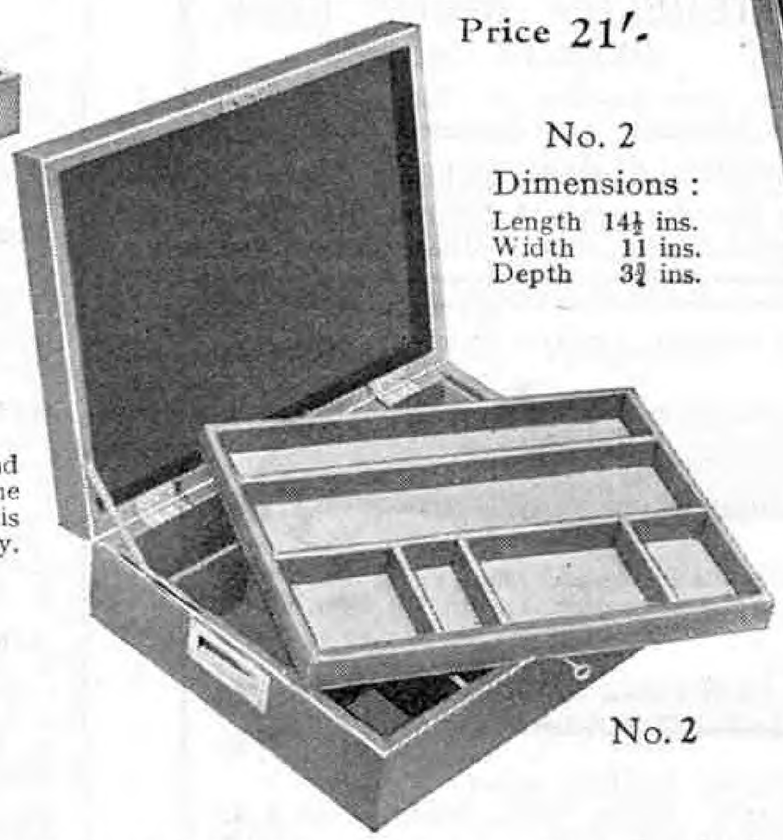
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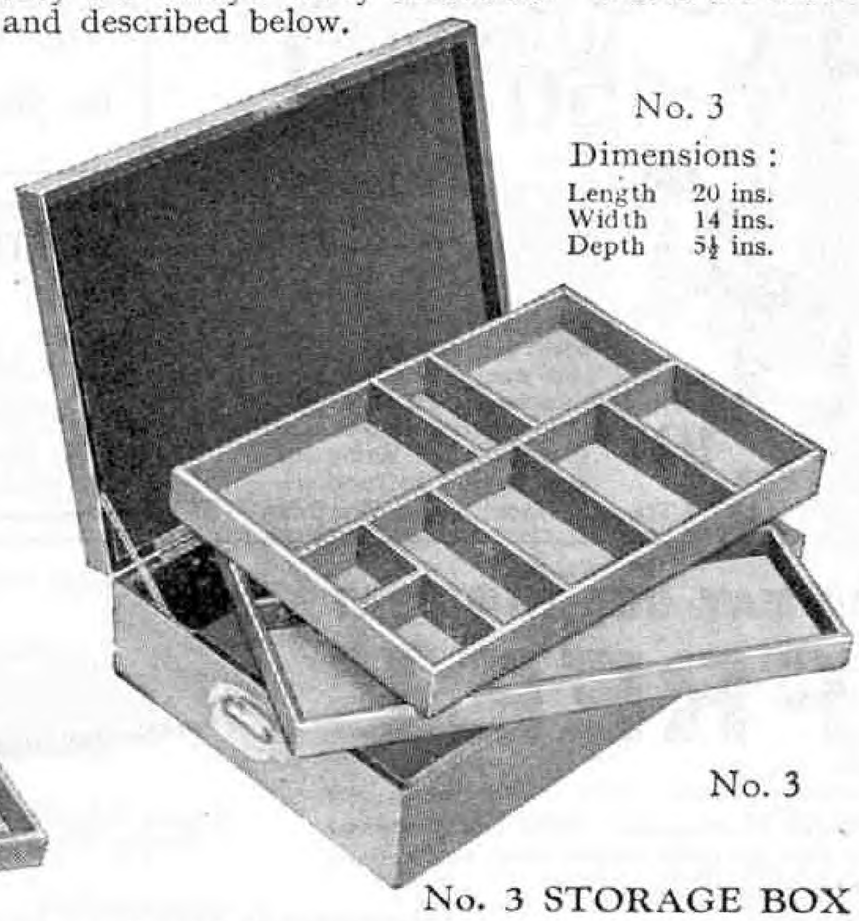
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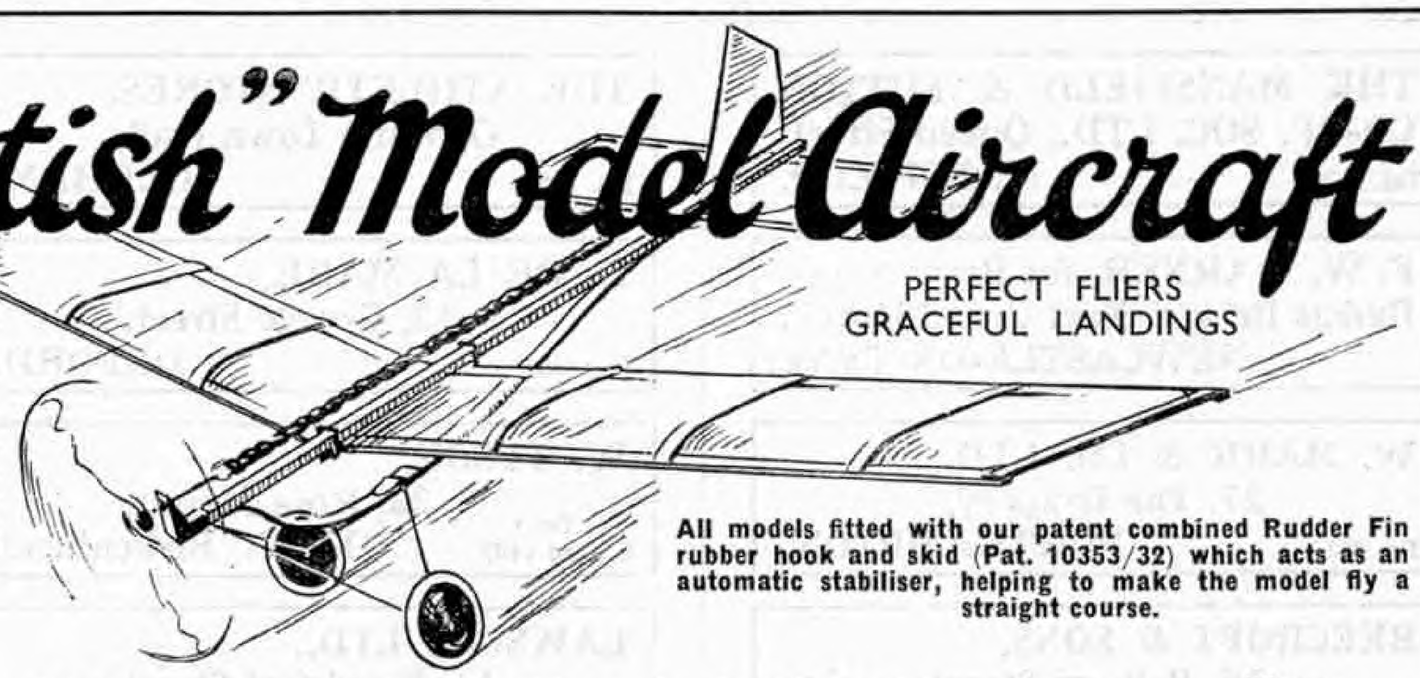
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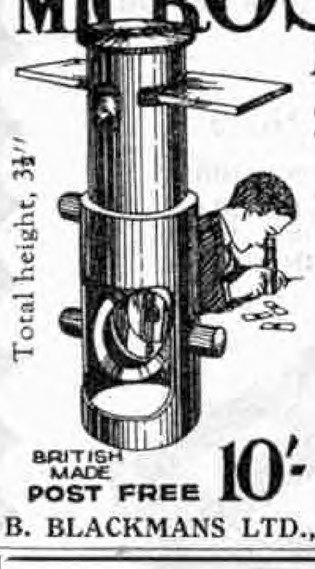
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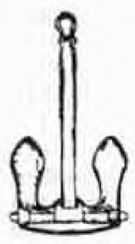


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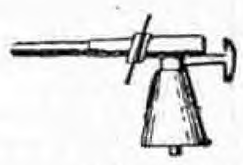
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Readers who are interested should write, mentioning the "*M.M.*," to Herbert Terry & Sons Ltd., Redditch, for further details and for a copy of the illustrated descriptive leaflet.

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How Meccano models helped American engineers to plan important bridges across busy waterways at New York was explained in an article that appeared on page 366 of our May issue, and in connection with this, we announced a Bridge-building Competition. Entries may be of any type and may be either original in design or reproductions of famous bridges, such as the Tower Bridge, Quebec or Sydney Harbour Bridges. Photographs or drawings should be addressed "Special Bridge Contest," Meccano Magazine, Binns Road, Old Swan, Liverpool, and the competition remains open until 30th July, 1932.

British Model Aircraft

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Further particulars of these interesting models can be obtained from the British Model Aircraft Company, 20, Chapel Street, London, E.C.2. Readers should mention the "*M.M.*" when sending their enquiries.

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EDITORIAL AND ADVERTISING OFFICE:—
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Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/– for six issues and 8/– for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

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Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/5 per copy (postage extra), and the subscription rates 9/6 for six months and 19/– for 12 months (post free); Canada, where the price is 15c. per copy, and the subscription rates 75c. for six months, and $1.50 for 12 months (post paid).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the home market. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned.

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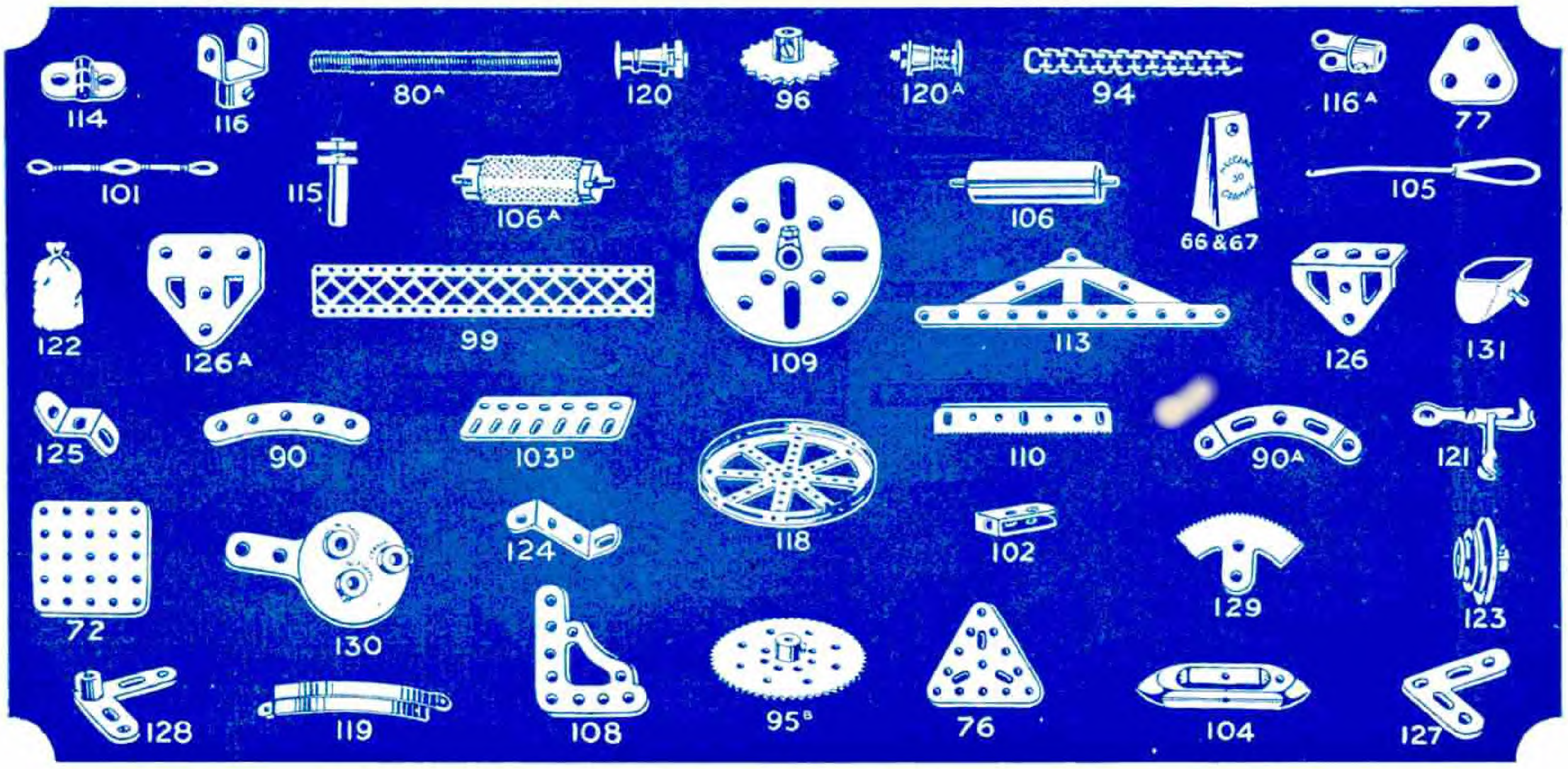
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67.	„ 25 „ ... ... „	1	0
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69.	Set Screws ... ... „	0	3
69a.	Grub Screws, 5 32" ... ... „	0	4
69b.	„ „ 7 32" ... ... „	0	5
70.	Flat Plates, 5½" · 2½" ... ... each	0	4
72.	„ „ 2½" · 2½" ... ... „	0	2
73.	„ „ 3" · 1½" ... ... 2 for	0	3
76.	Triangular Plates, 2½" ... ... each	0	2
77.	„ „ 1" ... ... „	0	1
78.	Screwed Rods, 11½" ... ... „	0	6
79.	„ „ 8" ... ... „	0	5
79a.	„ „ 6" ... ... „	0	4
80.	„ „ 5" ... ... „	0	3
80a.	„ „ 3½" ... ... „	0	3
80b.	„ „ 4½" ... ... „	0	3
81.	„ „ 2" ... ... „	0	2
82.	„ „ 1" ... ... „	0	1
89.	5½" Curved Strips, 10" radius ... „	0	2
89a.	3" „ „ cranked, 1¼" radius, 4 to circle ..	0	2
89b.	4 „ „ cranked, 4½" radius, 8 to circle ..	0	2
90.	2½" „ „ 2½" radius	0	1
90a.	2½" „ „ cranked, 1⅝" radius, 4 to circle „	0	1
94.	Sprocket Chain ... ... per 40" length	0	6
95.	Sprocket Wheels, 36 teeth, 2" diam. each	0	5
95a.	„ „ 28 „ 1½" „ „	0	4

No.		s.	d.
95b	Sprocket Wheels, 56 teeth, 3" diam. each	0	6
96.	„ „ 18 „ 1" „ „	0	3
96a.	„ „ 14 „ ¾" „ „	0	3
97.	Braced Girders, 3½" long ... ... ½ doz.	0	9
97a.	„ „ 3" „ ... ... „	0	8
98.	„ „ 2½" „ ... ... „	0	8
99.	„ „ 12½" „ ... ... „	2	6
99a.	„ „ 9½" „ ... ... „	2	0
99b.	„ „ 7½" „ ... ... „	2	0
100.	„ „ 5½" „ ... ... „	1	0
100a.	„ „ 4½" „ ... ... „	0	10
101.	Healds, for looms ... ... doz.	0	9
102.	Single Bent Strips ... ... each	0	1
103.	Flat Girders, 5½" long ... ... ½ doz.	0	10
103a.	„ „ 9½" „ ... ... „	1	2
103b.	„ „ 12½" „ ... ... „	1	3
103c.	„ „ 4½" „ ... ... „	0	9
103d.	„ „ 3½" „ ... ... „	0	7
103e.	„ „ 3" „ ... ... „	0	6
103f.	„ „ 2½" „ ... ... „	0	5
103g.	„ „ 2" „ ... ... „	0	4
103h.	„ „ 1½" „ ... ... „	0	4
103k.	„ „ 7½" „ ... ... „	1	0
104.	Shuttles, for looms ... ... each	5	0
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No.		s.	d.
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111.	Bolts, ¾" ... ... 2 for	0	1
111a.	„ ½" ... ... 3 for	0	1
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116.	Fork Pieces, Large ... ... „	0	3
116a.	„ „ Small ... ... „	0	3
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126.	Trunnions ... ... each	0	2
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130.	Eccentrics, Triple Throw ... ... „	1	0
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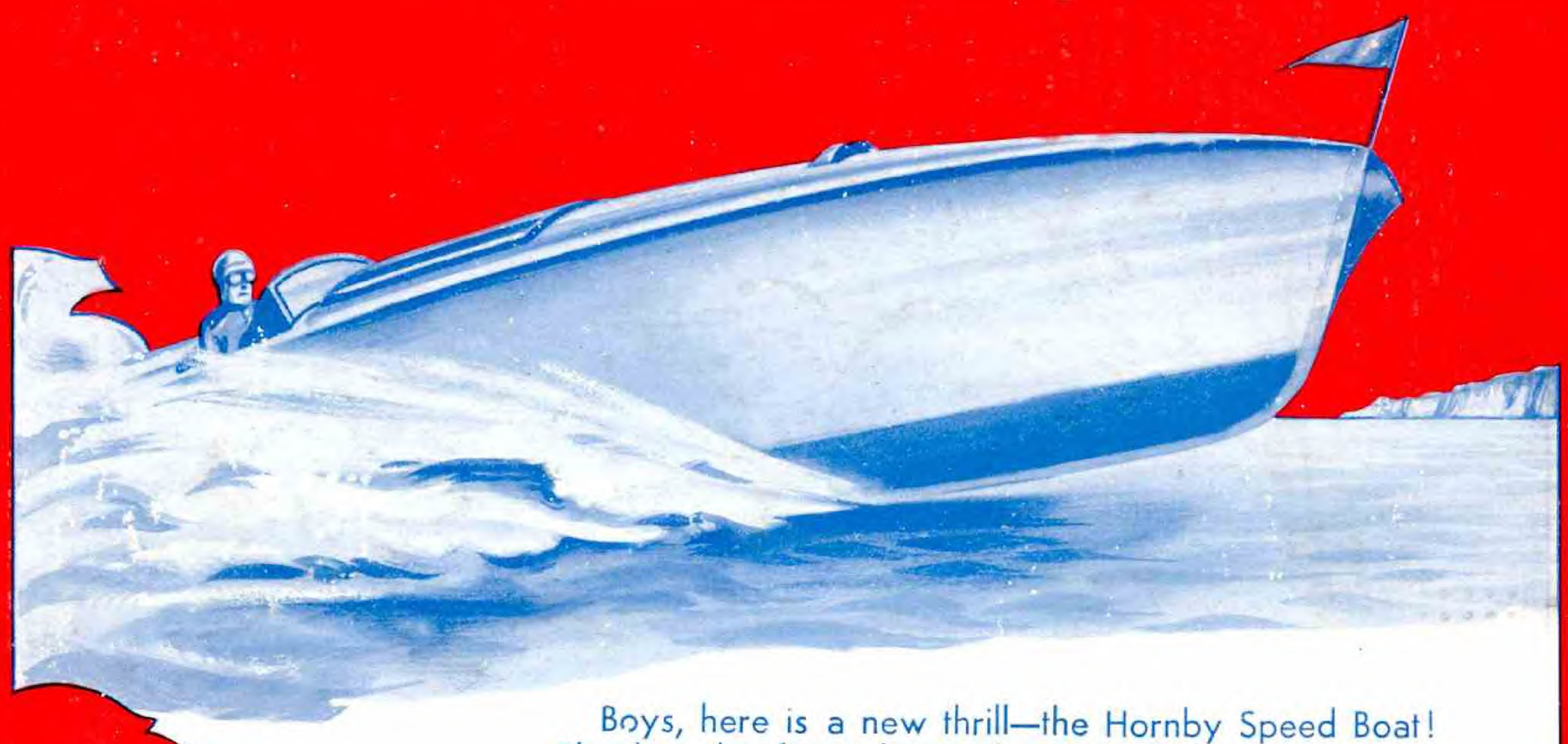
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